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An Explanation of a Peculiar Optical Delusion Caused by Lightning.

TO THE EDITOR OF ELECTRICAL REVIEW:

On the occasion of the last lecture before the Electric Club, which I had the pleasure of attending, among the many interesting lantern slides of lightning shown to the audience by Dr. Moses Parker, one in particular attracted much attention, and also provoked quite a discussion. It was a photograph of a flash of lightning three-quarters of a mile away from the camera.

At the distance of one-quarter of a mile from the camera a telegraph wire was stretched. In the picture, the lightning appears to be nearer the camera than the wire, inasmuch as the wire cannot be seen at all at a point in the line of the flash where it appears to have crossed it. The flash was

DRAWING FROM PHOTOGRAPH SHOWING PECULIAR ACTION OF ELECTRIC FLASH.

seen (in the photograph) on the side of the wire nearer the beholder, while in reality it was on the farther side away from him. We were told by Dr. Parker it was raining when the photograph was taken.

Many comments (invited by the lecturer) were made by persons present, and many explanations were given why this curious appearance should be, but none seemed to meet with general approval. During the animated discussion, an idea suggested itself to my mind (which I did not like to advance until I had opportunity to test it), which seemed to account for this peculiar phenomenon. That it may serve as a solution of the question, I think I have proven by the following very simple experiment, a short account of which I send you:

I took two brass rods about the size of a telegraph wire, polished one and blackened the other. These I mounted on a little wooden stand, the wires being parallel, and about one inch apart. I placed this arrangement in such a way as to be in front of a two-inch spark of a Holtz machine; that is, between the spark and a camera containing a sensitized plate. I then photographed the whole, spark and rods, as they stood, with the following result: The spark appears to be continuous over the polished brass rod, while there is a decided break across the space which we know to be covered by the blackened one, and which rod is also in front. The blackened wire in the lantern slide I mark A, and the polished wire, B. This photograph is but an imitation on a smaller scale, of Dr. Parker's beautiful slide; and I think I have conformed to all the conditions as stated by him.

I now think I can account for the similarity in the two cases, on the supposition that the telegraph wire having been wet by the rain, acted in the same way as my polished wire in the experiment, and that the supposed appearance of the flash of lightning *before* the wire (in Dr. Parker's photograph) was really due to the reflection of the light *around* the wire, which thus seemed at that point of intersection to be obliterated by the continuous flash line as it passed from the clouds to the earth. The fact that this continuous light streak does not show (in my photograph) in the case of the blackened rod (it appearing interrupted as it should be), and that it *does* seem continuous in the case of the spark across the polished rod (which I have attempted to use as a substitute for the rain-moistened telegraph wire), may be considered evidence in support of my theory. I send you by this mail the little lantern slide. If Dr. Parker would like to have one of them I shall be pleased to send it to him at any time.

Respectfully yours,

New York, Dec. 4th. JULIAN A. MOSES.

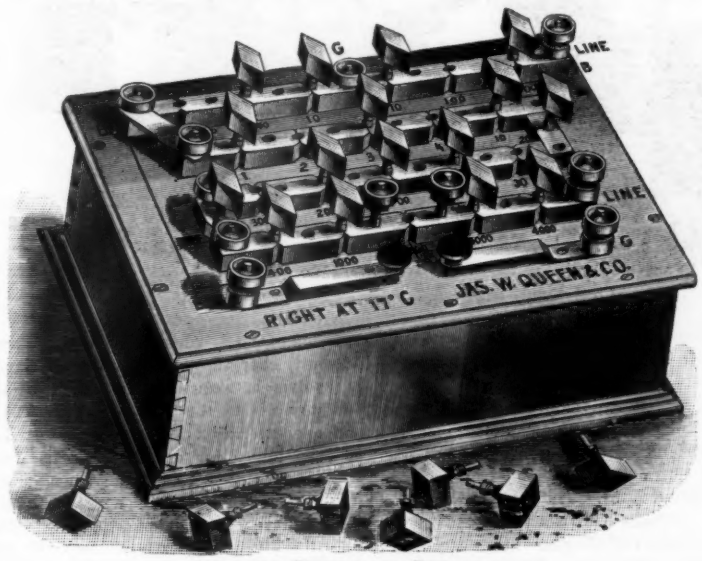
The Underground Question Before the National Electric Light Association.

The question of burying the electric wires promises to be ably and intelligently handled at the next convention of the National Electric Light Association. A meeting of the special committee appointed to make a report on this subject, is in session in this city this week, at the offices of the association, No. 16 East 23d street. The members of the committee are: E. T. Lynch, Jr., chairman; Walter C. Kerr, I. H. Davis, F. B. Crocker, and C. H. Barney.

If the committee will thoroughly investigate the New York underground situation, they will have some interesting developments to report. Chairman Lynch is pretty well informed in this regard. Altogether, we expect to see some important results from the work of this committee.

A Competitive Test of Light.

At Pittsburgh, after a test of the candle-power of the various illuminants had been made under the direction of the board of awards, which test showed the superiority of the incandescent lamp as compared with naphtha, gasoline, gas, etc., the board re-advertised for lighting the city on a broad gauge principle, taking in arc, incandescent lights, gas, gasoline, naphtha, etc.



IMPROVED BRIDGE AND RHEOSTAT.

New Standard Resistance Coils.

Progress is always a logical consequence of competition. In hardly any other modern enterprise has progress been so rapid and competition so marked, as in electric lighting and in electric power distribution. The electric light companies find it absolutely necessary to economize in every respect. The manufacturing companies have to turn out the best of machines, lamps and wires. The old-time guesswork has to retreat before competition, and more scientific ways must be employed to make both ends meet. The laboratory used to be regarded as an institution without any right in the neighborhood of a dynamo builder's shop, and was considered by many merely as an ornament for universities, well enough for theoretical professors. Times have changed considerably; one of the most complete electrical laboratories in the country is that of an absolutely practical man, T. A. Edison; and the laboratories of the larger electrical companies surpass any average college laboratory. No wonder that the demand for the finer test instruments has increased wonderfully, as it has; but it is very strange to say that the leading country in electricity has had to rely, for the best instruments, on the slow-progressing centers of civilization of the European continent. But from what we see and hear, the days of the supremacy of England, Germany and France, in matters of instruments, are counted. Electricians of eminent practical and theoretical knowledge have taken things in their hands, and with the aid of their help and instruction, the manufacturers will be able to compete with and, no doubt, in time, to surpass the foreign manufacturers. We learn that the well-known house of James W. Queen & Company, of Philadelphia, have entered quite largely into the manufacture of electrical test instruments, and have made an arrangement for the sole right to manufacture the instruments designed by Prof. W. A. Anthony. The above firm have also a number of new instruments of their own design, and make the important announcement that Prof. Anthony will test and calibrate all the finer resistance coils, etc., and that they will be sent out with a written certificate signed by him. Prof. Anthony is so well known in the electrical world as having had much experience in this kind of work, that we think our electricians will fully appreciate the advantage of this arrangement. For fuller description of all the testing instruments made by James W. Queen & Company, we can best refer to a circular issued recently by this firm. To-day we are able to give a description and illustration of one of the new standard instruments. Though it is not precisely new in its general design, it has some particular features which are worth mentioning. The general arrangement is seen from the illustration; on the instrument itself an opening will be provided for inserting a thermometer. Everything in this new post-office pattern is made as substantial as possible; pegs and brass blocks are extra heavy. The holes in the middle of the brass blocks serve for testing or using the coils separately, eliminating contact resistances. For this purpose the two pegs with binding post heads are used. These extra holes may also be used for receiving pegs not in use. The wire of the coils will be exceptionally thick for a set of this kind, and all connections will be made to reduce errors of different temperature co-efficients to a minimum. For all these standard instruments, Prof. Anthony will guarantee the coils to $\frac{1}{50}$ of one per cent. If desired, however, greater accuracy may be obtained.

Recent Supreme Court Patent Decisions.

An interest in the net proceeds of collections for infringements of a patent does not necessarily involve an interest in the patent itself.

The infringer is liable for actual, not for possible, gains, for the fruits of the advantage which he derived from the use of the invention over that which he would have had in using other means then open to the public are adequate to enable him to obtain an equally beneficial result.

If there was no advantage in the use of the plaintiff's invention, there can be no decree for profits, and the plaintiff's only remedy is by action at law for damages.

If the defendants gain an advantage by using the plaintiff's invention, that advantage is the measure of the profits to be accounted for, even if from other causes the business in which that invention was employed by the defendants did not result in profit.

A court of equity will itself administer full relief by awarding as an equivalent or a substitute for legal damage a compensation computed and measured by the same rule that courts of equity apply in the case of a trustee who has wrongfully used the trust property to his own advantage.

A court in equity will require an infringer to account for the gains and profits which he has made from the use of a patented invention instead of limiting the recovery to the amount of royalties paid to the patentee by third persons.

Effect of Electric Currents on Plants.

Professor E. Wollny, of Münich, has experimented on the effect of electric currents of different intensities and characters on the

growth of plants. Small plats of about four metres square were provided, and were separated by plates penetrating 25 centimetres into the soil. On the two sides of one of these beds, plates of zinc were sunk, the dimensions being 30 centimetres by two metres. They were connected by an insulated wire, with five Meidinger cells in the circuit. Another enclosure had an alternating current constantly sent across it, while in a third there were simply buried a copper and zinc plate, connected above the earth by an insulated wire. The three enclosures were therefore subjected to different conditions—to a weak direct current, to a comparatively strong direct current, and to an alternating current. Several specimens of grain, potatoes, carrots, etc., were planted, and were subjected to the action of the currents until they reached maturity. Comparing them with plants grown under ordinary conditions, the result to which Professor Wollny is led is, that electricity, whether under the form of continuous currents of different intensities, or of alternating currents, exerts no influence on the vegetation of plants.

OUR OMAHA LETTER.

(Special Correspondence.)

In marking the advance of electrical progress in Omaha and the West, it is a source of gratification to note that our citizens and manufacturers are fully awake to the advantages and possibilities of the new force, and are lending all possible assistance to further the usefulness of the same.

We can announce the completion of the electric motor railway between Omaha and Council Bluffs, over the new bridge. The cars run noiseless and smooth, with variable speeds, at will of the engineer. The Thomson-Houston system is used, with overhead wire. At the power house we find two 200 horse-power compound engines (Westinghouse), furnishing power to the dynamos.

Omaha has been second to none in securing electric light facilities, and now prides herself on having a very perfect system. The light is furnished by the Thomson-Houston system, and the city is practically in perpetual daylight. An interior inspection of the power station shows the management to be all that could be desired, the machinery nicely arranged, and every thing showing an air of prosperity.

The Interstate Fire Alarm Company, formerly the Richmond Fire Alarm Company, of Richmond, Ind., has located here, with T. R. Polglase as general manager. This company has recently made great improvements in its specialities, and is now running with a full complement of hands turning out their non-interfering fire alarm systems.

The Midland Electric Company and L. W. Wolfe Company find a place amongst us, dealing in and manufacturing electrical supplies, and report business flourishing, with prospects never better.

I am sure I voice a popular sentiment when I say that Omaha extends a helping hand to the electrical workers, and offers the great West as a most desirable field.

C. M. R.

Omaha, Neb., Dec. 4, 1888.

An Immense Electric Lighting Station.

In the London *Electrical Review* is a description of the station of the London Electrical Supply Corporation. At the Stowage wharf, Deptford, this corporation is laying down plant sufficient for the supply of 250,000 incandescent lamps, and there is space for three other sets similar to the first, giving a final capacity of one million lamps. The grounds of the corporation have a river frontage, with a wharf for landing fuel and heavy machinery. A 50-ton derrick has already been erected. The buildings occupy a space of 210 by 195 feet, and the height will be 100 feet.

The boiler house is 195 by 70 feet, and is constructed to hold boilers of 65,000 horse-power, and of these, 13,000 horse-power are being erected. The boilers will occupy the two lower floors, with stowage room above for the fuel. The two engine houses are of nearly the same dimensions as the boiler house, and are very massive in construction. In the first of these houses a pair of 3,000 horse-power engines will soon be erected, and will drive two Ferranti dynamos, each capable of supplying current for 25,000 lamps. These are the largest electric generators in the world, and we can get some idea of the increasing size of dynamos when we remember that four years ago the largest practical machines were Edison's "Jumbo" dynamos of 1,200 lights capacity. In the second engine room will be placed two sets of engines and dynamos. These are combined in such a manner that the armatures of the dynamos are driven directly by the engines and act as their fly-wheels. The speed is but 60 revolutions per minute. There will be four dynamos, and they will, finally, have each a pair of 10,000 horse-power engines. At present they are to have but 5,000 horse-power each. All future extensions of plant will be in these units. The dynamos will weigh 500 tons, and the armatures will be 45 feet in diameter.

The distribution will be on the alternating current system. The current leaves the station at the enormous potential of 10,000 volts, and is taken to a number of distributing stations where a first conversion takes place, lowering the potential to one or two thousand volts; then it is taken to the points of consumption, where a second conversion takes place, and the voltage is lowered to that necessary for the lamps.

The main cable, $2\frac{3}{8}$ inches in external diameter, is formed of two concentric tubes of copper. An insulating compound separates the two tubes, the central portion of the cable being hollow; the sectional area of each tube is .5 of a square inch.

The first two dynamos of 1,500 horse-power each are nearly completed, and will soon be erected; two of the 10,000 horse-power dynamos will probably be finished in about five months. The space now covered with buildings will accommodate 40,000 horse-power, and the rest of the space available can accommodate 80,000 horse-power more, a total capacity of 120,000 horse-power.

This station, in capacity and the enormous potential used (the maximum electro-motive force is about 15,000 volts), far surpasses anything that has been attempted in this country or anywhere else. It is hardly to be hoped that the scheme will succeed without great trouble and discouragement at first, since many of the conditions are new; but whether it finally fails or succeeds, the experience it will give will be of great benefit to electricians.

—— At Eau Claire, Wis., the first installation of the National Electrical Manufacturing Company (W. K. Freeman, the inventor) has just started up.

—— A movement is on foot to establish an incandescent electric light plant in Kingston, N. Y., for the purpose of lighting stores, offices and private residences. An agent of the Thomson-Houston Electric Light Company, of New York City, is at present in Kingston, with such an object in view. He has begun a canvass of the city for the purpose of soliciting subscribers. The intention is to form a local stock company, and already a number of prominent business men have associated their names with the enterprise.

Large Dynamos Building.—Revolving Field Magnets.

We represent here two of the very large dynamos to which reference was made in former issues. Fig. 1 represents the Gerard alternate current dynamo, of which the peculiarity is that, contrary to the usual custom of revolving the armature, it is made stationary, while the field magnets are attached to the flywheel and revolve with this between two stationary rims, which carry 72 armature coils each. This system of making the armature coils stationary allows the connections to be changed in the most simple manner, so that the machine may be used for any different purposes requiring either tension or quantity, as by shifting the connections the volts may be increased at the expense of the amperes, or *vice versa*. Even a part of the stationary armature coils may be so combined as to feed arc lamps, and another part of the same armature for incandescent lights. Fig. 2 represents the Hungarian generator alluded to last week. It consists actually of three different machines revolving on the same axis, and may thus be regarded as forming one machine. The vertical steam-engine on top is of 200 horse-power, giving the shaft 180 revolutions per minute. On this shaft is fixed a gramme armature of five feet diameter, revolving between its stationary field magnets, with which it is connected in series, in the usual way. The armature of the alternate current, however, does not revolve, but is stationary, while the coils of the field are attached to the fly-wheel, and are kept permanently charged by the gramme machine. It revolves between two stationary drums, one interiorly to the rim of the fly-wheel and one exteriorly. This fly-wheel carries 36 coils joined for quantity, and has a resistance of only 0.0039 ohm; when joined in six circuits the resistance was 0.61 ohm, while it gave a potential of 57.6 volts. The first machine of this kind, used at the Vienna exhibition of 1883, gave when driven by 140 horse-power, a total amount of electric work done by both the gramme ring and armature fly-wheel, of only 85 per cent. It supplied, however, the lighting of that exhibition without the slightest interruption, but it is stated that since that time its economy has been much improved.

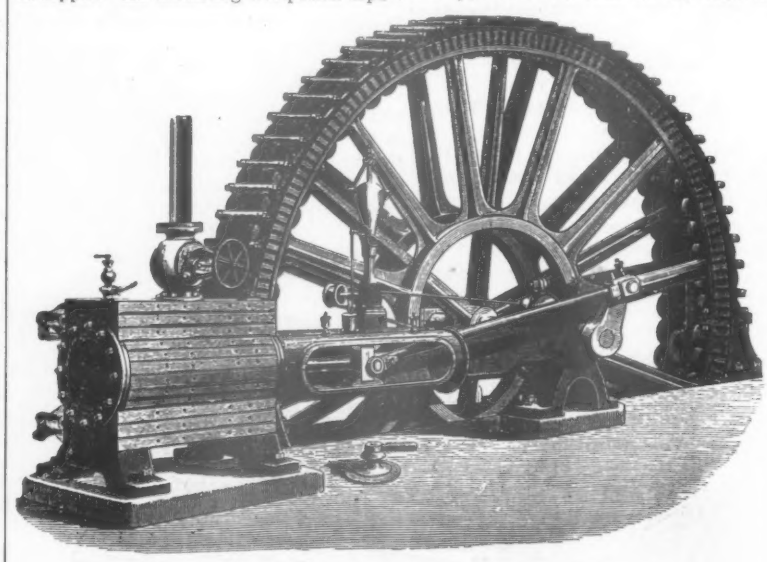


FIG. 1.—THE GERARD ALTERNATING CURRENT DYNAMO.

—— The new Edison electric light station Philadelphia, will probably be in operation before the new year. The building will cost $150,000, and the total investment, including 84 miles of underground copper wire, will be $1,000,000. The peculiarity of the building is its arrangement, which was referred to in a general way in our columns when the work was begun. It is six stories high, and is built for solidity and strength rather than for appearance or decorative effect. On the first floor will be placed 20 engines of 250 horse power each. On the second floor there will be 40 dynamos, with a total capacity of 60,000 lights. The third floor will be used for the workshop. The fourth floor for 10 boilers of 500 horse power each. The fifth floor will accommodate 1,000 tons of coal, which will be fed by pipes to the furnace under each boiler. The sixth floor will be devoted to the general offices of the company and will be fitted up in a very elaborate manner.

SOUTHERN ELECTRICAL NOTES.

(Special Correspondence.)

At Birmingham, Ala., it is proposed to create the office of City Electrician, whose duty it will be to have general superintendency of the various electric systems, but more particularly to watch fire alarms, and see that they are always in working order.

Last week, in Macon, Ga., a goose flew against the telephone wire and snapped it in two, but the goose was not injured in the least.

Mr. Robert Lee Shriner, formerly of Baltimore, has been placed in charge of the electric light plant of the Norfolk & Western Railroad Company at Roanoke, Va.

Two hundred electric light poles have been received in Birmingham, Ala., and placed in position on the South Highlands.

An old negro woman in Brunswick, Ga., on first seeing the electric lights, exclaimed, with thankful fervor: "Lord er massy! It er good ting dem white folk didn' fin' dis out in slavery times, case dey would uv worked us niggers all day, an' all night, too!"

Night Manager Sutphin, of the Western Union Telegraph office at Birmingham, Ala., says business is like it was in the days of the boom; nine day, and five night operators are now employed in the Western Union office, and have all the work they can do.

The Southern District Telegraph and Electric Company, of Birmingham, have just sold to a Florence syndicate an electric light plant for $3,000. This company has also just put in a plant for the Stevens' Electric Company, which lights the Georgia Pacific and Great Southern shops.

At last the Albany, Ga., Electric Light Company have purchased a lot for their plant, and the city will soon be furnished with 300 lights of 20 candle-power.

At Ft. Gaines, Ga., on November 22d, little Jimmie Haygood died, at the age of 13 years. He has been the efficient operator in that office, since the death of his father, several months ago.

At Richmond, Va., November 15th, Conrad Waggoner, a white man, was run over by an electric street railway car and killed. His body was cut nearly in twain, just above the hips. This is the first fatal accident caused by the electric cars, since the system was adopted in Richmond.

The third dynamo of the Congaree Gas and Electric Lighting Company has arrived, and will be placed in position, at Columbia, S. C. The new dynamo will increase its capacity to 30 arc lights.

Mr. Alex. Henderson, who is superintendent of construction for the Brush Electric Light Company, in the Southern States, has in his home an exceedingly interesting collection of curiosities, picked up by himself in the course of a career that has carried him into almost every part of the civilized world. He has visited China and Japan, besides many of the European countries, and spent several years in Mexico in the employ of the Brush Company. The most interesting part of his collection comes from Mexico, whence Mr. Henderson has brought antique Mexican idols, hideous and horrible in their rude ugliness; beautiful specimens of Mexican onyx; rare and rich devices in feather work, done by Mexican Indians, and photographs of the Aztec calendar and sacrificial stones, and of the gorgeous altar in the cathedral of Guadaloupe.

A private company is negotiating with the Brush Company for an electric light plant at Hickory, N. C.

The Phoenix Electric Light Company, of Marshall, Texas, has been incorporated; capital stock, $25,000.

D. F. Torbett is making arrangements to erect an arc and incandescent electric light plant at Tuskaloosa, Ala.

At Thomasville, Ga., negotiations are being made for the erection of an electric light plant.

At Newport, Ky., an electric light company has been chartered, with capital stock of $50,000.

At Chestertown, Ind., a stock company is negotiating to erect an electric light plant, to cost $7,500.

At Dayton, Tenn., efforts are being made to organize a stock company to erect an electric light plant; capital, $5,000.

At Sherman, Texas, the city will soon erect an electric light plant.

At Chattanooga, Tenn., linemen have been busy the past few days erecting poles and running wires from Morbet street out to West Sixth street. The line is to be extended to a point near Hughes' saw-mill, in

the vicinity of the Roane Iron Company, where the electric light company will remove their central station. The system is to undergo an important change. The Brush system will be abandoned, and the Thomson-Houston substituted for lighting.

The directors of the Electric Street Railroad at Chattanooga, held a meeting on the 21st of November, and the condition of the road was discussed and found to be satisfactory. It was decided that electricity should be used. The operation of the road will necessitate the building of an immense electric plant to furnish motive power. Work will be pushed on the track-laying with all possible dispatch.

The Knoxville (Tenn.) Electric Light and Power Company have recently put in a large plant (Thomson-Houston system), and will shortly turn on light.

A special committee on lighting the city of Galveston, Texas, have invited bids to light the city for a term of five years, from May 3d, 1889. Bids to be received on or before the 5th day of January, 1889, at 10 o'clock, A. M. Address bids to J. Reymershoffer, chairman of special light committee, at City Hall, Galveston, Tex.

EDWARD A. OLDHAM.

Charleston, S. C., Dec. 4th, 1888.

Boston Wants More Electric Lights.

If the opposition to Mayor O'Brien is mainly due to the fact that there are too many electric lights in the city, we are sorry to say that his opponents are very badly off for implements and methods of attack. The fact is that, considering the size of the city and the extent of our population, there is not a city in the entire country so scantily lighted by electricity as is Boston. The *Commercial* is satisfied that whether Mr. O'Brien or Mr. Hart is elected, the interests of the city will be well looked after, and that, too, the public demand for more electric lights in our thoroughfares and side streets must be met to the satisfaction of the people in all sections of the municipality. One electric light in the "dark spots" of Boston is as good for the public safety as are two policemen. *Give us more electric light.—Boston Commercial.*

Reorganization of the Baxter Motor Company.

The Baxter Electric Manufacturing and Motor Company, of Baltimore, on Tuesday of last week made a deed of trust to Mr. J. F. Morrison, the managing director, who furnished bonds for $100,000. The company is to be reorganized on a scale that will bring more capital into the concern, so that the growing business of the company can be actively prosecuted.

A New Sprague Road at Cincinnati.

During the past week the Sprague Electric Railway and Motor Company, of New York, has closed an important contract for electrical equipment in street railway work.

This is with Mr. H. L. Littell, president of the Inclined Plane Railway Company, of Cincinnati, Ohio, and calls for the entire equipment of the Main street line of that railway, consisting of 20 cars operated over six miles of track.

Mr. Littell, who residence is in Louisville, Ky., is well known as the first president of the Street Railway Association of this country, and is one of the most successful street railway presidents in the United States. In the equipment of these cars the Sprague improved truck, with improved "Boston" motor, which has been described in these columns, will be used. Iron poles of a tasteful design, and set in concrete, will be used throughout the entire length of the road to carry the overhead wires. The regular Sprague working conductor, less than an eighth of an inch in diameter, will be carried over the center of the street, and the main portion of the current will be carried at the side, according to the regular Sprague system.

The cars after leaving the city terminus, and running a short distance, come to an inclined plane, where they run upon a platform and are raised to the top of the inclination, after which the roads extend, using the overhead system for the rest of the distance.

Both the incline and the cars will be brilliantly lighted by electricity, each car and the power station will be equipped with Sprague patent lightning arresters, and all the latest and best improvements adopted by the Sprague Company upon their roads will be used here.

The New Motive Power on the Comstock.

A despatch from Virginia City says: A test run of the Nevada 60-stamp quartz mill was made to-day, with electric power generated by dynamos, operated by Pelton water-wheels, on the Sutro Tunnel level of the Chollar incline, 1,700 feet below the surface, and transmitted by a copper wire to motors on the surface. It was satisfactory in every respect. The plant is the largest in the world. The water-pressure on the Pelton wheels on the Sutro Tunnel level is 680 pounds to the square inch. Of this power, 60 per cent., representing 435 horse-power, is delivered on the surface to the Brush motors, which revolve at a speed of 850 revolutions per minute. The power which operates the surface motors is obtained from six dynamo machines placed on the Sutro Tunnel level of the Chollar incline. The dynamos are propelled by that number of Pelton wheels, driven by 200 miner's inches of water discharged on them from a height of 2,100 feet.

The success of this experiment is considered of vast importance to the future of the Comstock, as the water-power of the Truckee River can be brought here with a loss of only 40 per cent. of its original power. The Truckee River is distant but 16 miles in an air line, and by taking advantage of its fall, a thousand stamps can be operated on the Comstock at a cost which will make it profitable to handle millions of tons of low-grade ore. The system is known as the Brush. The test was witnessed by all the mine and mill superintendents, and a dense throng of spectators.

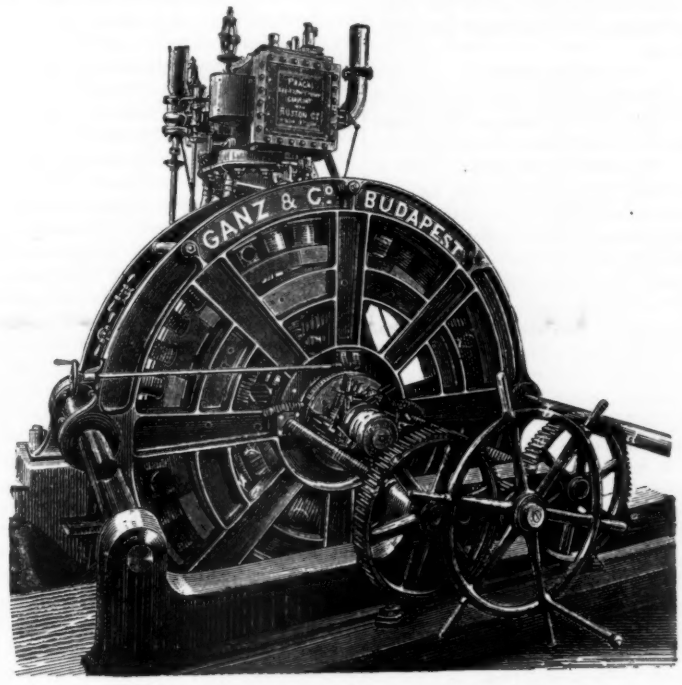


FIG. 2.—THE NEW GENERATOR OF GANZ & CO.

What the Board of Electrical Control Has Accomplished.

The New York Board of Electrical Control in suspending work on the subways for the winter, has a sorry record of results to show for a three years' experiment in burying electrical wires. The board was created to meet an undoubted demand from the public to remove the "unsightly poles and dangerous wires" from the streets of our city. In attempting to meet this demand it has obstructed our streets and offended our nostrils for some years, in burying all manner of conduits, good, bad, and indifferent, and the total result is about as follows: Conduits planted with a total capacity of 30,000 miles of single wire, or quite enough to remove every conductor from the poles and the house-tops. But with this capacity only about 6,000 miles of single wire are actually in the conduits, and of this not more than 600 miles are actually in operation; that is the lines of the Metropolitan Telephone Company, on Sixth avenue. The Western Union Telegraph Company, the largest owner of wires in the city, is said to have not a single foot of wire in operation in any conduit built by the Subway Commission.

The trouble is, that the Commission, as situated, did not know what was wanted in a proper electrical subway, and seems to have taken little trouble to find out from other and expert sources. Like the steam-heating company, which they now charge with interfering with the efficiency of their downtown wires, they seemed to think that their first and last duty lay in burying "something" under the pavements, without the slightest attention paid to actual conditions or demands of service. They have spent a lot of money for some one, and have made a general nuisance of themselves; and yet, New York to-day has actually more wires strung along its streets than when they commenced operations, and the condition of our streets is worse than ever in having just so much more plant buried beneath the surface, that will require constant tinkering and digging up, if it is to be in any way available.—*Engineering News.*

The Telephone at Bermuda.

The importance of telephonic communication is becoming recognized in our colonies and dependencies as well as in the mother Country. The last mail from Bermuda brought the information that at length telephone wires have been stretched right through the islands. At present, however, the only places on Ireland Island that have availed themselves of the telephone are the Officers' Club and the Co-operative Stores, but it is considered pretty certain that the Admiralty will very shortly connect the dockyard and the superintendent's residence, and place the colonial and military authorities in other parts of the island in communication with each other.—*London Electrical Review.*

Topeka, Kan.—The Kansas Phonograph Company. Capital, $250,000. Incorporators: P. I. Bonebrake, H. P. Dillon, G. E. Tewksbury, S. S. Ott, Topeka; H. Wicks, Kansas City.

Chicago, Ill.—The International Light and Fuel Company, of Chicago; capital, $10,000,000; for the manufacture and sale of light and fuel in all parts of the United States, Central and South America. Incorporators, Alvin B. Clark, John H. Hardy and A. M. Bannister.

Cincinnati, O.—The Ohio Phonograph Company, of Cincinnati, with a capital stock of $1,000,000, filed a certificate of incorporation. The company is formed for the purpose of leasing and selling phonographs and supplies, the incorporators being George Moerlein, Frank Overbeck, James L. Anderson, J. M. Dawson and W. J. Overbeck.

Whitman, Mass.—The Whitman Electric Company. Capital stock, $20,000. Daniel A. Gurney and others, incorporators.

Newport, Ky.—The Newport Electric Light Company, of Newport. Capital, $50,000. John B. Taylor and others, incorporators.

Plymouth, Mass.—The Plymouth Electric Light Company. Capital stock, $30,000, to furnish electric light and power to Plymouth.

Ashland, Ore.—The Ashland Electric Light and Power Company, of Ashland. Capital, $15,000. H. B. Carter and others, incorporators.

Camden, N. J.—The Spellier Electric Time Company, of Camden. The authorized capital is $200,000, of which $10,512.50 is said to be paid in.

Washington, D. C.—The Columbia Conduit and Cable Company, Washington, D. C. Capital, $500,000. A. D. Hazen and others, incorporators.

New York City.—The Johnstone Underground Electric Light and Power Company. Capital, $25,000. W. H. Johnstone and others, incorporators.

Davenport, Iowa.—The Hawkeye Electric Manufacturing Company, of Davenport. Capital stock, $51,000. M. L. Marks and others, incorporators.

Martinez, Cal.—The West Hill Water and Electric Light Company, of Martinez. Capital stock, $40,000. Arthur Noble and others, incorporators.

Camden, N. J.—The Manning Machine Company filed articles of incorporation, with an authorized capital of $100,000, of which $1,050 is said to be paid in.

East St. Louis, Ill.—The Friede Automatic Station Indicator Company, of East St. Louis. Capital, $1,000,000. Incorporators: S. W. Friede, Leon Goldman, and J. D. Abeles.

Chicago, Ill.—The International Construction Company, Chicago. Capital, $50,000. Lawrence C. Boyle, John R. James, and John Ritchie, incorporators. To build railroads, telegraph lines, etc.

Orange, N. J.—The Essex County Electric Company, of Orange. Capital stock, $100,000. Stuart Lindsley and others, incorporators. The purpose of the company is to establish a plant to light the city of Orange.

Lee, Mass.—The Lee Electric Company has been incorporated, with a capital of $15,000. Wellington Smith is president; David Dresser, treasurer; Wellington Smith, David Dresser, and T. T. Robinson, directors,

Portland, Oregon.—The Willamette Falls Electric Light Company, of Portland. Stock, $1,000,000. D. Thompson, E. L. Eastham, P. F. Morey, R. H. Thompson, L. L. Hawkins, W. R. Smith, and J. C. Moreland, incorporators.

Lenox, Mass.—The Lenox Gas and Electric Company has been incorporated, with a capital of $30,000. W. R. Plunkett is president; C. E. Merrill, treasurer; W. R. Plunkett, Alexander Kennedy, T. T. Robinson, and R. D. Wilson, directors.

Chicago, Ill.—The Timlin-Heidenger Car Heater and Illuminator Company, of East St. Louis; capital, $2,000,000; for the manufacture and sale of the Timlin-Heidenger heater and illuminator, and to equip cars and engines with the same. Incorporators, James D. Baker, M. H. Chamberlain and David J. Timlin.

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GEO. WORTHINGTON, - - Editor.
CHARLES W. PRICE, - Associate Editor.
T. J. McTIGHE, Electrician and Manager Patent Bureau.

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☞ No attention will be paid to communications without the *name and address of the writer.*

We invite correspondence from Electricians, Inventors, and the Telegraph and Telephone fraternity and those engaged in Electric Lighting, on matters pertaining to electrical and scientific subjects, and all facts of special interest in connection therewith.

We extend to manufacturers of electrical apparatus an invitation to send to this office any and all facts concerning their business which will be of interest to the public. We make no charge for publishing news.

Subscribers can at any time have the mailing address of their paper changed by sending both old and new address.

NEW YORK, DEC. 15, 1888.

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We are glad to learn that the membership in the National Electric Light Association is increasing. The value of this organization has been proven in many ways in the past, and, we predict, it will continue to grow and develop and become more influential and representative year by year.

The committee on insulation and installation of the National Electric Light Association, will find much to interest them in the experiments now being made by the contractors for the underground conduits, and it is to be hoped they will find time to avail themselves of the opportunity.

We read with deep regret that all the fishing stations on the lakes are to be connected up with the telephone, for, as soon as the fishing season opens we shall be continually called up to hear the number and size of the fish the boys are catching. As a means of precaution, we shall still follow our old custom of hearing the evidence, but reserving our decision until we *see* the fish.

Prof. C. F. Brackett, professor of physics at Princeton College, is announced to deliver the next address before the Electric Club, December 20. Few gentlemen occupying so prominent a position in educational circles have taken the time to devote to electrical experiment and research that Professor Brackett has, and his appearance at the Club assures an evening's entertainment that every electrical worker will find most profitable and valuable.

Power, as well as light, will be distributed from the great central station of the Edison Company in Philadelphia, now nearly completed. The power of 20 engines, each of 250 horse-power, will be divided up into small parcels, and sent over the mains to the hundreds of shops in the vicinity when they shall have got rid of their steam engines. This, as has been shown before, they must do sooner or later, because of the comparative cheapness of electrical energy when compared with steam power.

A gentleman interested in the large business office building corner Pine and William streets, told us last week that the owner's bills for incandescent lighting (Edison system) range now between $40 and $85 per month, against $80 to $140, the price they used to pay the gas companies. At the same time they are getting more and a better light. These figures represent only the cost for lighting the halls, two great basements, and closets, etc. The office-renters pay their own bills, but these bear the same ratio of reduction as to the present cost.

The Western Union Telegraph Company is thoroughly disheartened with its underground service for, though $1,500,000 has been expended upon such work since 1876, it is, for the most part, uncertain and unsatisfactory. Superintendent A. S. Brown is reported as saying that all their underground lines were comparatively valueless, and, if there was any way out of the difficulty, his company had not been able to find it. Further, he said that the company felt the imperative need of an underground service, and should any means be discovered of successfully operating underground they would gladly avail themselves of it.

Our English cousins have often declared, and with some reason, be it said, that they observed in us an inclination to run to quantity instead of quality; to be big instead of good, as one might say. Just now, however, there is a plan a-foot to erect a central lighting station in London, with enough dynamos to give two 10,000 horse-power engines work up to their full capacity; "calc'lating," to use an Americanism, to furnish 2,000,000 lights of the incandescent variety. As to "quantity," this station will assuredly "take the cake," if we may be allowed once more to drop into the vernacular—but—but as to the "quality," we are not yet able to speak, though, of course, wishing the undertaking every success.

AN OPPORTUNITY FOR THE ELECTRIC CLUB.

The success of the Electric Club, of this city, the pioneer of a number throughout the country, has been gratifying, and its objects have been and are being carried out in the true spirit in which they were conceived. Great good is being done in a very quiet way. It has been shown that ordinary club life can be made something more, something better than a mere blind adherence to the epicurean doctrine, "Eat, drink and be merry, for to-morrow you die."

Besides being an admirable school for the acquisition of knowledge, by the friendly interchange of valuable experiences, the monthly meetings add largely to the self-imposed curriculum of the club. But there is yet something desirable to have in the club-house, namely, a collection of electrical apparatus. This will take the character of a museum which, while serving the purpose of an expository grouping of electrical and magnetic devices, could readily be made to constitute a historical museum of electrical progress. This can be easily brought about, and once fairly started, its growth will be surprising. And in order that future generations may, while tracing the evolutions of the electro-mechanic arts, know and honor those whose sometimes uncertain, sometimes steady footsteps traced the multitudinous paths in the wilderness of ignorance, let these keen pathfinders now leave some footprints after them. How instructive it would be, years hence, to find a collection among which would stand the pioneer machines and devices of our electrical inventors! What a clear insight into the ability and foresight of the inventors of the past two decades we could get by inspecting the first actual devices and machines which they produced as the perfected form of their invention! It would, indeed, be a valuable collection for the Electric Club to possess. And now, while nearly all the electrical inventors who have done so much of the practical development are still with us (and may they long remain), what is to prevent the Club from seeking from each the gift of all such first models. Why not thus try to acquire the first working set of duplex and "quad" instruments, the first complete stock-printer, the first fac-simile transmitter and receiver, the first dynamos and motors, the first magneto-telephone, the first battery transmitter, the first induction transmitter, the first arc lamp made in this country, the first incandescent lamp of the filament style, the first magneto-bell for telephone lines, the first and the perfected phonograph, the first converter, and the first of hundreds of other devices, all of which have contributed the bone and sinew for the greatest strides ever made in this world, and made mostly, we are happy to say, in this country. The inventors would be honored by such an exposition, and we are confident they would be found willing to contribute to such a museum, as it would be for their achievements "a monument more lasting than brass," and would carry their fame down into the dim future in a way which could not be realized by a thousand tomes of biography, autobiography or memoirs. The museum is in reach; shall the Electric Club have it?

For probably the first time in the history of electric lighting, it has come out ahead in an open competition with gas, oil, gasoline, and all other forms of light, has beaten them all on their own ground. The city of Pittsburgh advertized inviting proposals for lighting the streets from lighting companies of every description. The bids were opened and it was found that 25 candle-power incandescents were offered at a less sum per year than 16 candle-power gas, oil or gasoline lamps. The city has awarded the contract to the lowest bidders, the East End Electric Light Company, who will use the Waterhouse arc system and the Westinghouse incandescent. Four hundred arc lamps will light the main thoroughfares, and 4,287 incandescent lamps the other streets. Last year a total of 83,200 candle-power cost the city $111,000. Under the new contract for electric light, there will be a total of 907,175 candle-power for $110,592, or over 10 times as much light for less money than before. The facts are instructive.

OUR CHICAGO LETTER.

(Special Correspondence.)

Miss Persis, daughter of L. B. Firman, treasurer and general manager of the Police Telephone Company, was married on the evening of December 1st to Mr. Stiles R. Slosson, at the residence of the bride's father, on Walnut street. Among the old-time operators present, who have grown bald, or gray, or wise with age and experience, were Col. J. J. S. Wilson, Prof. J. P. Barrett, E. B. Chandler, and your correspondent. The best wishes of friends and a few slippers followed the young couple as they left the home roof, to which they will return after a short wedding trip.

Mr. Charles Crane a few days since, presented to the West Division High School a Holtz machine, an electrophorous, a Leyden jar battery, and a discharger. The tendency in our schools and among older students, is towards electricity, and there is no safer way to educate the masses to comprehend the freaks of electricity and the dangers of handling that subtle force, than to experiment with a static machine, and a fair assortment of Leyden jars. The energy displayed is like that patent medicine which everybody takes. Who monkeys with a static machine invariably "takes it," if the play is long continued; albeit it is harmless, and is an excellent teacher.

It was intimated sometime in the early days of the telephone muddle, that if certain things were done, and certain other things were not done, then possibly the Chicago Telephone Company would turn some sort of a legal back somersault, as it were, and re-transfer its franchise to the Bell Company, of Boston. The Mayor, on the 1st instant, received the following from President Phillips, which explains itself:

"The HON. JOHN A. ROCHE, *Mayor.*

"*Dear Sir:* You are respectfully notified that hereafter all applicatons for permits, etc., from the city in regard to telephone wires, etc., will be made in the name of the Bell Telephone Company, of Boston, Mass. Yours respectfully,

Chicago, Dec. 1, 1888. GEORGE L. PHILLIPS."

This move seemed a surprise all round. Members of the council had been constantly asserting that the Chicago company was doing business under a franchise which did not belong to it, but to the Boston company, and could not be transferred. The president has taken them at their word.

Comments on the situation are various. The Mayor acknowledged surprise, but said the finance committee could not accept the offer of 2½ per cent. The people demanded a reduction of rates, and now the matter must go to the courts.

The controller, who with the Mayor favored compromise, said that the finance committee could have obtained a revenue of $35,000 to $50,000 per annum, which would be better than a legal tussle with the company.

Chairman Wetherell, of the finance committee, said that by accepting the 2½ per cent. the committee would acknowledge the legal standing of the Chicago company in the face of the decision of the corporation counsel, declaring the franchise transfer illegal. "We simply couldn't do it. There was a decided fight for lowering the telephone rates to subscribers. It would not have benefitted the druggists, liverymen, undertakers, etc., appreciably if we had compromised on 2½ per cent."

A new lighting company turned its first wheel on the 7th instant. The Merchants' Arc Light and Power Company, an organization of which Mr. Robert Bines is president, and has its central station located at 327 Dearborn street. The plant will, for the present, consist of four 20-light Sperry dynamos of the latest and most approved pattern. The current is constant at 20 amperes with a potential of 30 volts. The full capacity of the dynamos will be utilized at once within a district bounded by Clark, State, Van Buren and Polk streets. More than usual pains have been taken in the selection of materials and the construction of the lines and the installation of the plant generally. Everything is of the best. The belting is Ireson's self-adjusting leather link, furnished by Messrs. Culver & Company, 54 Lasalle street.

Manager D. A. Perry, of the Sperry Company, tells me he is having a lot of bamboo loops made which are to be placed on proper lengths of cane fishing poles. One of these will be presented to each user of lights on the Merchants' Company's lines, with instructions to patrons to switch out their lamps, when it is time to close the store or other place of business, with this neat switch pole.

"You see, by gosh!" he says, "it don't make any difference how many lamps are cut off at once, the Sperry automatic regulator takes care of all that sort of thing without a wink, whether it is two or thirty. We can do it, don't you see? We don't talk—we do it."

Fire on the 5th completely "pied" the Illinois Belding Motor Company's offices and salesroom at 182 Jackson street. The fire occurred on the floor above the company, and while it left everything in splendid confusion, the loss will be but slight.

A company has been formed, with a capital of $2,000,000, to undertake the laying of a cable from a point on Bell Isle to the coast of either Scotland or Ireland. This will give to Canada its own cable.

Elgin's Council has been having a severe case of *mal de ventre* on the electric light question, which has finally came to a head at the last meeting, by its contracting with the Fort Wayne Jenney Company for a complete outfit of city lights, for $15,525. The mayor, it is believed, will veto the ordinance, but on the other hand, it is thought the Council will carry it over his veto. Five years ago the Elgin Electric Light Company constructed a plant which included eight towers. The city's contract with that company expired last month, and bids were asked, after the Council had decided to buy a plant, and had appropriated $16,000 for that purpose. Bids, as the poet would have it:

> "Fell as the nuts fall when Jack Frost has chilled 'em,
> Or Jersey mosquitoes, when Christmas has killed 'em."

Fourteen by actual count, and it is presumed there were some lost in the shuffle. A correspondent says of bids: "They ranged from $13,000 to $22,000, and each company had energetic representatives on the ground. For the last two weeks the air has been full of rumors alleging fraud and corruption. The council has spent a large portion of its time travelling from one city to another examing various systems. To-night the fight came to a head, and the contract was let by a vote of 10 to 3, after a session remarkable for the number of times the lie was passed without bloodshed resulting."

The various electric light companies are gradually closing up the year's business, and will show when the month closes, a large increase of lighting in the city and vicinity, over the years past.

The Edison people have placed over 10,000 incandescent lamps in Chicago alone, and have several thousands more to come in the early months of 1889. The United States Company has also forged well forward, and will make a showing which tells of a long stride ahead.

The Mather Company has quietly but surely gained on its former record, and the same may be said of the other companies.

The Western Electric has now in process of completion, plants at the following places: Marshall Field & Co., retail, 16; Wheeler & Tappan, 12; McCormick Harvester Works, 35; Consolidated Ice Machine Co., 10; and J. Curran, 35; a total of 108 arc lamps. C. C. H.

Chicago, Dec. 8, 1888.

An Electrical Excursion.

Mr. John A. Seeley, 18 Cortlandt street, the well-known electrician, is arranging a grand excursion to Washington, to attend the inaugural ceremonies of Marcn 4, 1889. Arrangements have been completed for a special train of Pullman palace sleeping coaches, to leave Jersey City at 10 P. M. Saturday, March 2d, arriving in Washington the following morning; the train will then be side-tracked at a point three minutes distant from the Capitol building, there to remain until 12 o'clock, midnight, of Tuesday, March 5th, at which time the train will leave, arriving in New York the following morning at 6 A. M., affording a trip of three full days and four nights, and giving comfortable sleeping accommodations during the entire time, thereby doing away with the annoyances of crowded sleeping accommodations afforded by hotels at that time. A number of electrical people have already declared their intentions of going.

OUR BOSTON LETTER.

(Special Correspondence.)

Captain W. L. Candee, of the Okonite Company, and Mr. John I. Sabin, of San Francisco, was welcome visitors at this office last week.

Mr. C. B. Wattles, general dealer in machinery, Providence, is doing quite a business with the "C. & C" motor in that city, and displays several motors in his new office at 34 Cove street.

One or two errors occurred in my correspondence last week, in the mention of Mr. Hamilton's enjoyable lecture, at Horticultural Hall. "Rotation of notices," should have read "rotation of vortices;" "chemical apparatus," should have been "chemical affinities," and "propagation" was intended in place of "propogation."

The Lamson Store Service Company have adopted the Eddy motor, to be used by them in all cases where electric power is applicable. Messrs. Dickerman, Adams & Co., the local Eddy Electric Manufacturing Company's agents, have installed a three horse power motor to run the Lamson Cash system at the store of Beals, Higgins & Henderson. Other recent installations by the same firm, are one horse power Eddy motor for C. N. Brown & Co., machinists, Harrison avenue, and one horse power for T. W. Ripley, printer, at 80 State street, where the motor is running three Kidder job presses in addition to a large Sheridan paper cutter.

Mr. A. L. Rohrer addressed the Electric Club on Wednesday upon the nature of electricity. An interesting historical sketch of the early workers in the electrical field was given, and a model shown of Faraday's dynamo made in 1831 and the first machine of the sort ever constructed. At the close of Mr. Rohrer's instructive remarks, a general discussion took place on points touched on in the paper.

The Baltimore *American*, of Wednesday last, contains a statement regarding the assignment of the Baxter Electric Manufacturing and Motor Company, to Mr. J. Frank Morrison, than whom there are few better known men in the electrical field. It seems to be the prevailing feeling here that this choice has been well made, as it carries with it a feeling of security to all parties to whom the company may be indebted, and enables the business to be carried on without interruption. Mr. Frank Ridlon, the New England manager for the company, is now supplying all demands for motors in this territory, as before the change was made.

The Jarvis Engineering Company, this city, has received the order from the Webster Electric Company, Webster, Mass., for the steam plant for their new station. They will put in two 150 horse-power horizontal tubular boilers, set with the Jarvis furnaces and two Armington & Sims engines, and will build a brick chimney 80 feet high.

Among the other orders for Armington & Sims engines, recently received, are Worcester Electric Light Company, two 100 horse-power; Franklin Electric Light Company, one 50 horse-power; New Bedford Gas Company, one 100 horse-power; Pearson Cordage Company, Boston, one 35 horse-power; Marlboro Street Railway Company, one 60 horse-power; New Haven Electric Company, two 90 horse-power; Bridgeport Electric Light Company, two 90 horse power.

Mr. R. T. White, the inventor of the Acme road-bed and other systems, is about closing arrangements with a prominent electric company, by which he will transfer to that company all rights in his electric conduit system for street railways.

Following are the officers reported by the nominating committee of the Electric Club, for the ensuing year: President, W. J. Denver; vice-presidents, H. B. Cram, G. L. Lang, Frank Fuller, A. L. Rohrer; treasurer, F. J. Boynton; secretary, R. F. Ross; historian, S. C. Peck; executive committee, G. B. Neal, C. M. Ransom, Eliot L. Caldwell, H. J. Pettingill, Jno. C. Wilson, A. H. Chapman, O. K. Stuart, John Post, Jr., S. E. Barton, J. R. Lovejoy, P. H. Alexander, Frank Ridlon, Edward Blake, William Brophy, E. H. Hewins, W. C. Woodward, G. W. Mansfield, G. W. Adams, J. T. Moriarty, A. B. Griggs. The annual meeting of the Club will be held on Thursday evening next, for election of officers and annual reports. An invitation has been extended the Club to visit the extensive works of the American Waltham Watch Company, on Wednesday next, a train leaving the Fitchburg station at 2.20 P. M.

The Rhode Island Electric Company, have a very complete and well arranged electric lighting station in their Providence plant, under the superintendency of Mr. John I. Drake. The large switchboard there in use, which is very compact and convenient, as well as several original testing appliances, are of Mr. Drake's own design and manufacture, and in them was shown the inventive ability which has since been made more manifest in several patented contrivances and pieces of apparatus which he is about putting on the market.

The Providence Steam Engine Company are doing a large business, as evidenced by the activity around their South Main street works. Among recent orders in this vicinity is one for a pair of Greene engines, to furnish power for the new shops of the Thomson Electric Welding Company, Federal street, Lynn.

The firm of Thurston & Co., the Electrical Supply Company, of Providence, are unable to fill all orders for wiring and other inside work in that city, owing to the great demand there for this kind of work.

Browne & Sharpe, the world-renowned makers of fine machinery and machine tools, are receiving more orders than they can fill, but expect relief when they begin the operation of their new works, which will be in about two months probably.

Pleasant features of a recent trip to this thriving city of Providence were calls at the American Electrical Works, where a warm greeting is always extended to any of the electrical fraternity, and at the New England Butt Company's busy works on Pearl street.

Boston, Dec. 10, 1888. T. W. S.

OUR PHILADELPHIA LETTER.

(Special Correspondence.)

The Thomson-Houston Electric Light Company, of Philadelphia, has sold three 35-light machines to the electric light company at Mahanoy City, Pa., in lieu of the two 35-light dynamos destroyed by the recent fire at their place.

The Mountain City Electric Light Company, of Altoona, Pa., have decided to double both the arc and incandescent plant of the T.-H. system, installed only a year ago; great increase of business is the very satisfactory reason given for the improvement.

Brother Hines, of the United States Electric Lighting Company, of New York, is again heard from, and this time it is in the shape of an alternating current plant of his system, for the illumination of the houses and stores in Pottstown, Pa.

The arc light plant of the Millville-Schuyler Company, at Millville, N. J., is now running to its full capacity, and its officers are now looking around for the best system of incandescents to add to the good work in that town.

At the last meeting of the electrical committee of Philadelphia councils, action was taken on the request of the Keystone Light and Power Company, to be permitted to lay their conduits and wires underground in certain streets in Philadelphia, and upon the showing made by the attorney of the company to the effect that councils had not the right to obstruct the efforts of corporations to avail themselves of privileges given them by State charters, it was unanimously resolved to report the ordinance favorably to councils, and it will undoubtedly be passed at the next meeting of that body. This ordinance has been pigeon-holed in the committee for two years, and its present action is no doubt hastened by the very broad hint conveyed by one of the city judges recently, that if the Keystone was farther hampered in its efforts to exercise its charter rights, the strong hand of the law would quickly aid it. S. H.

Philadelphia, Dec. 10.

Mr. John I. Sabin left Sunday morning for San Francisco, taking Mr. H. D. Stanley, of Bridgeport, with him as a bodyguard as far as Chicago.

OUR WASHINGTON LETTER.

(Special Correspondence.)

The Committee on Public Buildings has received two plans for lighting the House of Representatives. One proposes placing the engines and dynamos in the building; the other provides for a new station building outside the grounds. The committee favored the former, and ordered some modifications which Mr. Powell is preparing.

The district authorities, after hopelessly wrestling with the wire problem for 15 years, have asked Congress to give them an electrical engineer, as an assistant in this branch of their business. This new officer may be a civilian, or an officer of the army or navy detailed to the duty. A bill reported to the House contains some provisions looking to further curtailment of overhead wires, but substantially leaves the matter in the hands of the commissioners. An appropriation of $35,000 is included for electric street lighting. Proposals are to be invited for lighting by any system. The bill reduces the price for arc lamps, lighted from sunset to sunrise, from 50 cents to 40 cents. The United States Lighting Company will oppose any reduction, claiming that, after having been compelled by the government to abandon many miles of pole lines and substitute underground wires at large outlay, it should not be forced to furnish lights at a loss. The company has increased its capital from $300,000 to $500,000 to meet the cost of new work done during the past year.

R. B. Smith, the agent of the Sprague Company, is putting up a 10 horse power motor to furnish power for printing the new Daily Washington *Press*. It will be run by a 220 volt 25 ampere current from the U. S. lighting station, at a cost of $10 per month for the first horse power and $5 for each additional horse power. This is the largest motor used in this city.

Geo. N. Church, president of a new street railway at Ann Arbor, Mich., which is to be built early next spring with some electric power, is making a tour of inspection of existing roads to determine what system to adopt. Delegations of municipal and railroad officials from Atlantic City and Chattanooga have been here this week to examine the Soldiers' Home road. This company continues to do a large business, and has ordered a fourth motor car.

It is not too early for representatives of electrical interests to consider the question of taking part in the World's Exhibition which it is proposed to hold in this city, from May 1st to October 31st, 1892. This is to be in connection with the permanent "Three Americas Exhibit," in honor of the four hundredth anniversary of the discovery of America, under the direction of this Government, and the promoters are sanguine that it will far exceed the Centennial Exposition.

Two new companies are organized under West Virginia charters, each with $500,000 capital stock and $10 shares, to introduce inventions of Capt. S. G. Cabell. They are The Electro-Magnet Boiler-Cleaning Company, Gen. Jno. B. Clark, president, and Charles W. Schneider, secretary; and The Liquid Purifying Company, Isaac Sharp, president, and J. C. Holcomb, secretary. The business of the former is to prevent the formation of scales in steam boilers, and the latter proposes to take headaches out of whisky by electrifying it. It is stated that they have machines in operation which will "electrify" 1,200 gallons per day, removing all impurities and immediately "aging" the whisky, while water, similarly treated, is deprived of all animalculæ and mineral substances and left as pure as distilled water.

G. C. M.

Washington, D. C., Dec. 8, 1888.

The Contract for Lighting in Pittsburgh.

To the Editor of Electrical Review:

At a meeting of the board of awards, of the city of Pittsburgh, December 6th, the following bids were submitted for electric lighting:

The Fort Wayne Jenney Company proposed to furnish 500 arc lights at $105 per year per lamp; 300 or less at the rate of $127 per lamp per year.

East End Electric Light Company, of Pittsburgh, proposed $120 per lamp for the first 100 lamps, and all in excess of the 100 arc lights to be furnished at rate of $100 per lamp per year.

The board of awards adjourned without action, but meet again at two o'clock on Saturday, to decide the question.

Saturday, the board of awards awarded the contract for lighting the entire city to the East End Electric Light Company. The principal thoroughfares to be lighted with Waterhouse arc lamps and the balance with 25 candle-power incandescent lamps; the work to be completed in six months. The contract is for three years, and amounts to $120,000 per year. Motor.

Pittsburgh, December 8th, 1888.

*** The new multiple switchboard system has been put in at Buffalo.

*** The American Telephone and Telegraph Company, whose lines to New York were the only reliance of newspapers of Boston during the blizzard last winter, has suffered considerable damage from the late storm. A number of poles on the Philadelphia and Boston lines were prostrated.

*** The *Sentinel*, of Milwaukee, Wisconsin, reports that on the 5th inst., Judge Dunn granted a temporary injunction, closing the exchange of the Superior Telephone and Telegraph Company at Superior in that State. The injunction was granted in favor of the Bell Telephone Company. The case will come up on its merits later.

*** The Flume Company and Brower & Thompson are building a telephone line from Latourelle Falls, their office on the O. R. & N. Railroad, to the saw-mill back in the mountains, Oregon. This will be a great convenience and will save many trips up the mountain. Those at the office can communicate with those sending lumber down the flume from the saw-mill, and can give orders without sending a messenger.

The Versatile Reporter Assists in Telephone Progress.

It will be remembered that when the Postal lines were first built between New York and Chicago an experimental trial with the telephone was had, and conversation, on a quiet Sunday, was indulged in between these two cities with fair success.

A few weeks ago a trial was given in Boston of the improved instruments used by the American Telephone and Telegraph Company, and the visitors in turn talked with New York, Philadelphia, Buffalo and Albany. An enterprising reporter made use of the event, and proceeded to describe how conversation was carried on between Boston and Chicago, stating that when Milwaukee was switched on the difference was scarcely noticeable. This piece of *news* was sent broadcast and the telephone people enjoyed reading it, and have only the criticism to make that the reporter was about two years ahead of them.

Superintendent Chas. H. Wilson, of the Central Union Telephone Company at Chicago, noticing the story, which was apparently an interview with the Boston manager of the telephone company, immediately wrote to Superintendent Hibbard, of the Long Distance Company in New York, as follows: "We have some pretty fair liars out here, but could find a place for your man when you are through with him."

Telephone Operators' Strike in Buffalo.

The so-called strike of the telephone operators of Buffalo has resulted in a permanent lockout. As told in the *Courier*, the disaffection began with the introduction of the new switchboard. The consequent reduction of the force was merely an anticipation of what the telephone company intended to do.

When 7.30 o'clock Tuesday morning came, the operators conferred briefly among themselves, and all but three left their tables. Superintendent Culbertson was told of the matter, and said to them that those who wanted to return could, and those who didn't want to needn't. Six returned and the remainder took French leave.

The pay of the present force, says President Hall, will be increased, and the faithful trio will be specially remembered. The hours at the present time are from 7 to 11.30 o'clock in the morning and from 1 to 6 o'clock at night, and it is proposed so to arrange matters that the working hours will be reduced. Mr. Hall gives the following tables of comparisons with other cities of the number of calls answered by each operator daily: Buffalo, central office, 470; Buffalo branch offices, 353; Albany, 449; Grand Rapids, 485; Milwaukee, 468; Louisville, 674; Baltimore, 1,132; Cincinnati, 650; New Orleans, 1,125; New York, 647.

Actions Begun Against Rochester Telephone Subscribers on Old Contracts.

At the time of the telephone strike in Rochester, N. Y., there were several contracts pending for telephone service, and many of the users of the instruments declined to pay after so many telephones had been discontinued. The Company sued George H. Worral for the amount he owed, and won the case. At the time the telephone trouble was settled, the company agreed not to demand pay on unexpired contracts that were renewed within a certain time. But there were a large number who did not renew. Last week the company served a number of summonses issued from the municipal court, to compel the payment on old contracts of the amount due from those who did not renew their service during the specified time.

The Telephone Office at Waterbury, Ct.

"Hello, central!"

How many times a day do you suppose that familiar call is fired at the pretty telephone operators at the Waterbury station? asks a correspondent. On the 11th, 12th and 13th days of last July the number of calls was recorded, and the numerical average of the messages for the three days reached the mammoth figure of 3,200 per day. The hello business was not unusually brisk on either of those days. It is evident that the operators at the central office who answer questions and make connections for 3,200 messages a day, must be endowed with a liberal quantity of nimbleness and accuracy. Waterbury is a network of telephones and 250 wires are in use at the local office. Although the system is so elaborate, wrong connections are, like the blasts on Gabriel's trumpet, few and far between.

The office is open 24 hours each day and seven days each week. The busy hours of the forenoon, when all the expertness of the operators is brought into activity, are from nine to eleven. In the afternoon the hour between five and six is the hustling one. Those are the hours of the day when a rush is always expected, but at any other time of the day an avalanche of helloes may be precipitated upon the office. It is not a very infrequent occurrence for an operator to receive half a score of calls at once. The celerity with which connections are made at such a time makes an unsophisticated observer dizzy. But of course 10 connections can't be made in a minute, and the man who isn't answered first, yanks the crank on the instrument and rings as though the house was on fire, wondering, meantime, amid his breezy ejaculations, why the operator doesn't wake up and answer him. "But," said Superintendent Young to a reporter, "the people of Waterbury are courteous and good-natured. There is of course a class of chronic kickers who are always finding fault with the telephone service, but we get used to them. As a general thing, however, our patrons are very complaisant."

Speaking of calling by number instead of by name, Superintendent Young said: "People are steadily acquiring the habit of using the numbers instead of the names. It is to their advantage to do so. We can give them a much quicker service when they call by numbers. After the first of January we shall expect the numbers to be used altogether."

The company is now thoroughly settled in its new quarters in the Masonic Temple. The apartments are elegant and spacious, and are a great improvement on the cramped rooms that were formerly occupied. The office is thoroughly equipped, and everything is reduced to a rigidly systematic basis. The facilities are thoroughly requisite for the annual transmission, in the ordinary course of business, of over a million messages. The telephone is an indispensable factor in the business life of Waterbury.

Mechanical Explanation of Electrostatic and Magnetic Phenomena.

Leonidas LeC. Hamilton, author of the "Origin of Energy," delivered a lecture at Horticultural Hall, Boston, recently, on the subject of "Electricity and Magnetism." The lecturer presented a mechanical explanation of electrostatic and magnetic phenomena which he finds in his theory of the origin of energy.

In commencing, Mr. Hamilton pointed out that the whole of science is based upon the elasticity of matter. No motion can be communicated unless the molecules are elastic. In order that a molecule may be elastic the inelastic atoms of which it is composed must possess the power of re-acting when acted upon. This energy possessed by each atom must be inherent because it possesses it *before* the external force acts. The atom's tendency to a peculiar form of motion must be either a rectilinear, vibratory or rotatory, tendency. It cannot be rectilinear, because an external force must act to produce such a motion. It cannot be a vibration, because the atom is a solid unit and possesses no parts to vibrate. It must, then, possess a tendency to rotation as an inherent energy.

The lecturer then explained the mechanical process involved in the building up of a molecule. The atoms, while rotating in a free state, as in a gas, upon colliding naturally hinder each other's rotation around their separate axes, and uniting their poles, rotate around a new axis common to both. Mr. Hamilton showed that this was possible, from the fact that he had found, by the analysis of the various forms of crystals, that each atom was a tetrahedron, because every form of crystal can be constructed with tetrahedra, varying only in the acuteness of their angles and the area of their bases (or masses); and these tetrahedra, rotating in the same direction, upon colliding with their poles would unite their poles and rotation around a new axis, and then form a molecule.

He explained elasticity of the molecule by the fact that after the atoms would be displaced by an external force, they would naturally thrust each other back into their former positions.

He then indicated that a mechanical explanation of the lines of force could be found, because the molecules rotating in the so-called ether would produce a vortex around each molecule. The vortices which would rotate in the *same* direction would repel each other at their equators, and tend to unite their poles, because they would not repel each other in that position. The vortices which would rotate in oppcsite directions would coalesce at their equators and repel each other at their poles.

He then pointed out that the mechanical resultant of a system of molecular vortices would be the formation of lines of force with the *vortices all rotating in the same direction*, joined together at their poles, because this would be the condition of least friction or least resistance. This was all plainly shown by diagrams, and disposes of the weak points in Maxwell's system of vortices, because it explains why the lines of force composed of molecular vortices exist and why they rotate in the same direction, which must all be assumed in Maxwell's system.

The lecturer then showed that a system of vortex lines or filaments all rotating in one direction, on coming in contact with a similar system, would explain mechanically the phenomena of repulsion, such as exists when the similar poles of magnets are brought near each other. He also explained that the so-called phenomena of attraction, such as appear when the dissimilar poles are brought in proximity to each other, would be produced by a system of vortex lines rotating in one direction coming in contact with a system of vortex lines rotating in the opposite direction. The lines would coalesce at the point of contact of the two systems and thus reduce the pressure at that point, and the dissimilar poles would be thrust together. The various phenomena were all explained by diagrams and experiments, and it was shown that the above results would be reached, whether we consider the lines of force to be rotating in the same direction from end to end of the magnet, or to be rotating in one direction in one-half of the field of force and in the opposite direction in the other half.

The lecturer then explained the various electrostatic phenomena by showing the mechanical effects of heat on the vortex lines, and pointed out that heat motion always exists on the surface of the negatively electrified body, which he explained to be an expansion of the lines of force in a direction perpendicular to them. This expansion of the vortex lines is produced by the molecular disturbance on the surface of the negatively electrified body which is known to be greater than that on the surface of the positively electrified body after frictional contact. The lines of force expand by the swinging of the nucleal molecules back and forth across the centers of their respective vortices. This expansion, which is equatorial, produces a shortening of the lines of force at that point, accompanied with a reduction of the velocity of rotation of the vortices. The shortening at the negative point must be accompanied with an elongation of the same lines at another point. This elongation in the axial direction must produce a contraction in the equatorial direction and an increased velocity of rotation of the vortices. This last produces a point of greater stress in the lines which the lecturer designates as positive electrification, and a less stress on the negatively electrified surface.

Discharge was shown to be produced by the breaking of the lines of force at the negative point, thus suddenly reducing the pressure in the direction of the lines of force, and a consequent displacement from the positive, or point of greatest stress. During the forward motion of the lines of force the vortices are stripped from the rotating nucleal molecules in the axis of the displacement, and the naked surfaces of the swiftly rotating molecules being brought in contact, results in a breaking up of the molecules, the observed heat and light accompanying the discharge. The velocity of rotation was shown to be enormous, since the rotating vortices carry on their surfaces from one to the other, the electro-magnetic disturbance known as light.

At the close of the lecture many questions were asked by persons in the audience, and were all satisfactorily answered.

Electric Lighting at Hagerstown, Md.

The electric light company has completed their plant at Hagerstown, Md., which consists of two 50-light machines and 100 arc lamps of 1,500 candle-power each, 65 of which are used at present for lighting the city, and others for commercial purposes. The lights are diagonally suspended at the intersection of streets, and give such satisfaction that an increase is contemplated shortly. Previous to this the town was but meagerly supplied with oil lamps.

The eight lights furnished the State fair held there proved such a success that many applications for bids have been received from neigboring towns, and the outlook for further installations in Maryland, Virginia and Southern Pennsylvania is very promising. The arc line consists of two circuits, which cover a distance of 17 miles. This part of the installation was under the personal supervision of Mr. Bruce Smith, of the company, who spared no pains or expense in making the plant complete in every respect, station, boilers, engines and electrical appliances being strictly first-class. In addition to this there are two 650-light Westinghouse alternate current dynamos for commercial and domestic purposes, installed by the Marr-Couster Company, of Pittsburgh, Pa., under the supervision of L. L. Kingsbury and C. F. Parmly. The incandescent portion of the plant started November 20th with over 500 lights, which have given such satisfaction that new orders are being taken and filled as rapidly as possible. The Marr Company have kept up their usual high standard of work; the electrical apparatus is so arranged on the switchboard that the lights can be turned from one machine to the other, or from any feeder to either machine without affecting the lights. The incandescent circuit covers the entire town, the furthest light being about two miles from the station.

The Taylor Manufacturing Company, of Chambersburgh, Pa., furnished the steam plant, which consists of two 25 horse-power automatic high speed engines, and two 150 horse-power steel return tubular boilers; the quality of their work is the best recommendation possible.

Ample room is provided for increasing capacity of plant, the building being 100x40, a substantial brick structure.

Coal is obtained direct from the mines, and delivered at boilers by a side track. The city water works furnish the water.

Induction and Leakage.

To the Editor of Electrical Review:

Evidently some people learn very slowly. Your New York contemporary of December 1 says editorially "that the evil of induction still exists in many cases, chiefly because the means for its thorough prevention, *i. e.*, the complete metallic circuit, has not been applied," etc.

Now, induction is not prevented by a metallic circuit or any other kind of a circuit. It is independent of any circuit. The excellent work of McCluer, at Richmond, was not begun for the purpose of stopping induction; he knew much better than that. What he stopped was leakage from one conductor to another, or, what I should now prefer to call it, "overflow." I stated years ago that the earth was not a reservoir of electricity, and that no electricity could be put into it but by taking some out elsewhere. This language was adapted to the ideas prevailing at that time. I am now satisfied that there is no current of electricity in the ordinary sense of the word current. I have for 20 years believed that let electricity be what it may, that is an accompaniment of matter in all its forms, wherever it may be; that it is an inherent property of matter and could not be separated from it except in extremely rare cases. (Vide journal of the Telegraph, 1878-79.) This agrees very well with the "Modern View of Electricity," and so there is no "leakage" or "overflow," as we understand these words, but only a production of motion in the matter intervening between the inducing and induced currents or conductors.

Mr. McCluer puts his wires in such a position that the motion given to the thing (the ether ?) in the earth was put in motion by the motion in inducing railway wire. But if his wires came sufficiently near, and for a moderate distance parallel with the railway, he was still troubled with induction, notwithstanding his metallic circuit.

Very respectfully,

D. Flanery.

Memphis, Tenn., Dec. 2, '88.

The Postmaster-General Favors a Postal Telegraph.

In the report of Postmaster-General Don M. Dickinson, is the following reference to the matter of Government telegraph:

"If the correspondence of the country is to continue to be under the charge and protection of the Government, the vast and increasing volume conducted by telegraphy, and the right of the great body of the people to be afforded facilities for the best and quickest transmission, at rates within the means of all, will press this subject upon the attention of the Congress with more and more urgency. The chief difficulties in the way are the great cost of present methods, and the absence of safeguard, which, according to the theory of the present mail service, should protect the privacy of correspondence. I have given the subject much consideration, and I believe that the inventive genius of this country has reached a stage in discovery in electric science when these problems may be solved. The subject is of such great importance to the people that I believe an opportunity should be given for the presentation and examination of inventions which have been informally presented to the committees of Congress, the Department and the public, and that a stimulus should be given to investors to turn their attention to the improvement of old methods. I recommend the appointment of a commission of competent and disinterested men, learned in the science, who may examine inventions, and invite others, who shall be authorized to erect short experimental lines, and who shall report to the President, or to Congress, the result of their investigations."

Election of Officers in the Non-Magnetic Watch Company.

At a meeting of the board of directors of the Non-Magnetic Watch Company of America, Messrs. H. W. Struss and A. C. Smith resigned as treasurer and secretary respectively. Mr. E. T. Gilliland was elected as treasurer, and Mr. Chas. P. Bruch as secretary. Mr. A. C. Smith remains the general sales agent for the United States.

A Very Satisfactory Engine Test.

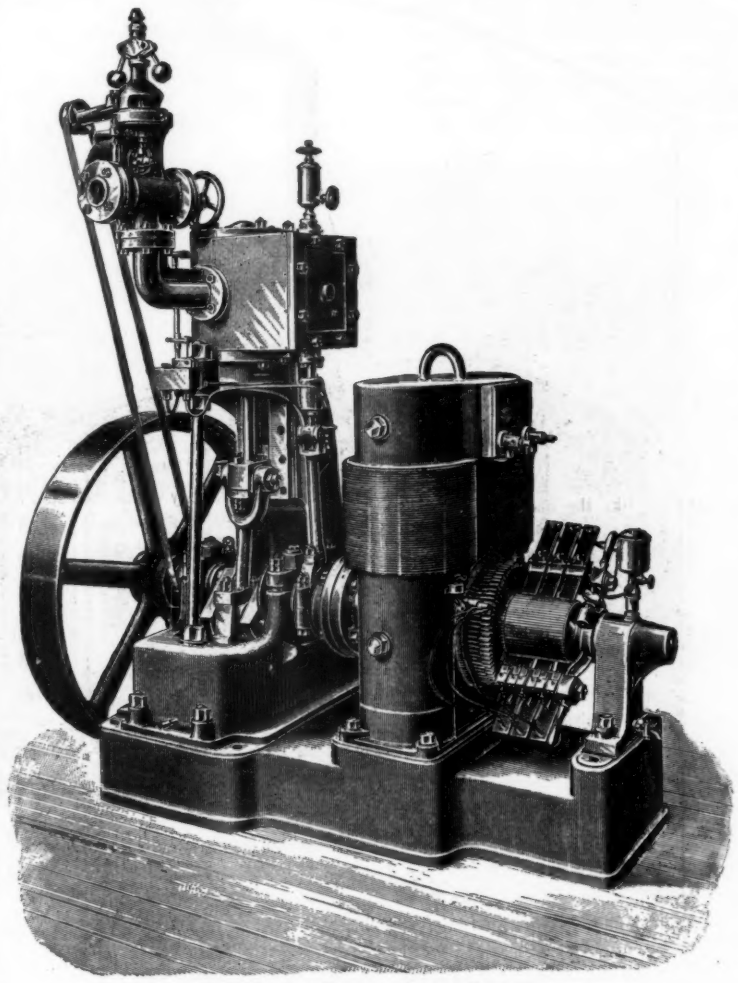
A test of two Armington & Sims engines used in connection with the electrical plant in the Drexel building, Philadelphia, showed the regulation to be nearly perfect. The engines are 9½" by 12", and a third one of the same make, 14" by 13", is to be added, and will drive two 500-light Edison dynamos. The following is the testing engineer's letter to the Philadelphia agents of Messrs. Armington & Sims:

Philadelphia, Nov. 23, 1888.

Messrs. Walker & Kepler,

Philadelphia, Pa.

Gentlemen.—Yours of even date at hand. We are very much surprised to learn that any person or persons should have intimated that you were not fulfilling your contract for the electric lighting of the Drexel building; and it gives us a great deal of pleasure to say that, notwithstanding the fact that the specifications accompanying your contract were of extreme severity, and aimed at a perfection hitherto unattained in automatic electric lighting, you have not only done all in your power to live up to these specifications, but you have absolutely accomplished the result.



The Holmes-Tangye Steam Dynamo.

I have just returned from the engineer's room, after having made the following experiment:

One 50 horse-power engine and 500-light dynamo in operation; 300 lights burning. Without notice to the engineer, who is about 100 feet distant, and in a separate room, I threw on 116 additional lights with one switch, then threw them off; subsequently threw almost the entire load off, then threw them all back again; then sent word to the engineer to start up another engine and dynamo. The load equalized immediately between the two dynamos, and the operation of throwing off and on the lights was again performed. Sent word to the engineer to stop one engine and dynamo. The first engine immediately took the load, and the various changes of condition had no sensible effect upon the lamps, and the pressure indicator at no time varied three points, immediately going back. We have no hesitancy whatever in saying that, so far as our experience has gone, the work comes entirely up to the letter and to the spirit of the specifications; and we have yet to find anything that would tend to make us regret any part of the work. If any persons are interested, and you would like to show them these experiments, we will be pleased to give them the facilities any afternoon after four o'clock.

Respectfully yours,

(Signed.) Wilson Bros. & Co.

Chas. G. Darrach.

give a number of users who are pleased with it.

Holmes-Tangye Steam Dynamo.

An electric lighting plant, for marine use, is shown in the illustration on this page. The description of it, taken from London *Industries*, is as follows: The engine is double acting, and of the "Archer" type, made by Messrs. Tangyes, Limited, and has a cylinder 6½ in. diam. and 6 in. stroke, the normal speed being 300 revolutions per minute. The dynamo is of the "Castle" type, introduced some time ago by Messrs. Holmes, and has an output of 80 amperes at 55 volts. The following particulars have been supplied by the makers: Resistance of armature, .074 ohm; resistance of shunt coils, 13.15 ohms; resistance of series coils, .037 ohm. The armature is 11⅞ in. diam., measured over the conductors, and 9½ in. long. The core consists of iron discs 11½ in. diam. and 2⅛ in. radial depth. The field magnets are of wrought iron, circular in cross section, and 8 in. diam. Considering the low speed of this machine, the size of armature is very moderate; and the floor space occupied by the entire plant is only 4 ft. 8 in. by 2 ft. 6 in.

Manufacturing Notes.

The Schenck Belt-holder and Shifter Company present in this issue a list of prominent machinery house from whom their belt-controlling devices can be procured. Those belt-holders are being handled by a number of leading houses.

The New York Belting & Packing Company, pioneers in the manufacture of vulcanized rubber belting, packing and hose, find their business steadily increasing. They have recently opened a branch house in San Francisco, Cal., which will be under the control of Messrs. Arnett & Rivers, and located at 17 and 19 Main street, that city.

The Wyckoff Pipe Company of Williamsport, is doing excellent work in the direction of furnishing creosoted wood conduits. Although the claims made for the conduit are strong, the company guarantees them in every point. Over 50,000 feet per day are sent out, yet the company is still increasing its plant and putting in new machinery. This pipe has been put down in Philadelphia and Chicago, and the manufacturers can

TELEGRAPHIC

.... The telegraph cable from Lewes to the Breakwater, which was broken by the late storm, has been repaired and communications to the latter place restored.

.... The Armourdale line of the Metropolitan Street Railway Company has been granted the privilege of adopting electricity as the motive power. The officials of the company are now looking for an electric railway system.

.... E. H. Betts, an expert telegrapher, died in Cincinnati, O., last week, aged 29 years. He was in the employ of the Western Union Telegraph Company for a number of years. His remains were taken to Richmond, Va., for interment.

.... In the suit of C. D. Lathrop, to recover $8,000 from the Postal Telegraph Company, for alleged errors in the transmission of important telegrams, a Circuit Court jury at Chicago returned a verdict for $690.50 in favor of the plaintiff.

.... An unfortunate train operator on the Denver and Rio Grande road made a bull in dispatching on the 25th, by which W. H. Phipps and J. H. Flinn were killed. The operator, C. A. G. Wood, was severely censured by the coroner's jury, but the censured party was far away before the verdict was rendered, and has not been seen since.

.... Mr. J. H. Hill, former superintendent of telegraph of the Southern Kansas Railway, has resigned to accept the position as secretary to the receivers of the Missouri, Kansas & Texas Railway, Messrs. George A. Eddy and H. C. Cross. Mr. Hill's headquarters will be at Sedalia, Mo., and the Review is pleased to congratulate him on his being called to fill the important duties of this position.

.... A despatch from Tacoma, W.T., says that Henry Villard and Thomas F. Oakes, president of the Northern Pacific Railroad Company, has purchased from Nelson Bennett, of this city, a three-fourths interest in his street railway system. Bennett has expended $25,000 on his system, but has a fifty-year franchise over all the principal streets of the city, most of which he already occupies. Villard and Oakes pay $100,000 for their interest. The company, as reorganized, will begin immediately to improve the system, putting on new cars and reducing the running time. Electric motors will be put on all feasible lines, while cables will be employed on Ninth and Eleventh streets. The purchase includes the water power plant on Chambers Creek, a few miles from the city, by which all necessary electricity will be generated. Large dynamos will be planted at the top of the hill at Eleventh street. The Vanderpoele system of electric motors will be used.

.... The Chicago & Alton Railroad has adopted an electric signal to protect the rear end of trains on Cayuga grade, at which point they descend with great speed, says a Bloomington, Ill., paper. The device consists of a bar running along the side of the rail, being raised about three-eighths of an inch above the rail, and the weight of an engine or cars running over it depresses the bar, which, when relaxed, starts a small dynamo encased in a small iron box near the track, connected with the telegraph line. The circuit being a metallic one, no ground connection is used. Thus a train leaving Odell depresses the slightly raised bar which starts the dynamo, whose current raises a semaphore arm, displaying danger, which continues in this position until the train has passed the station at Cayuga, when the Odell arm is lowered or released, and a similar arm is displayed at Cayuga until released at Pontiac, so on at each succeeding station. These signals are very costly and have had a thorough test, and it is the intention of the C. & A. Railway to equip all dangerous places with it where trains are most exposed.

The Pacific Electrical Storage Company, of San Francisco, Cal., will soon begin the erection of a new building at Sausalito, for the storage of electricity for lighting and power purposes.

The town Council of Hampton, Va., has granted a charter to the Hampton and Old Point Railway Company, with the privilege of using electricity as a motive power should the company so desire.

The REVIEW has received the illustrated catalogue issued by H. J. Jaeger & Co., No. 45 John street, New York. Scientific apparatus manufactured and imported by this company, are described.

The Edison Electric Light Company is now running its mains along on the rear of the buildings on the east side of Thames street, Newport, R. I., and will probably be able to supply customers in that section with light by the last of the week.

The cars for the electric railway at Sacramento, Cal., have arrived. Each car carries 80 storage batteries which are placed underneath the seats. The total weight of car is 10,500 pounds. The batteries can be charged to from four to six horse-power.

The National Conduit Company, of Philadelphia, is about to make tests of an electric motor on the Traction Company's Columbia avenue line, between 23d and 33d streets. President Kemble, of the Traction Company, said that there was no intention of substituting electric power for the cable, but that the conduit company was merely given permission to make a trial of its system.

The Central Railroad Company, of Louisville, Ky., are erecting a brick building, 60x100 feet, at Seventeenth and Walnut streets, for the plant to operate their road by electric motors, and if results are satisfactory the company will adopt electricity as a motive power for their other lines, as previously mentioned. A 250 horse power engine will be put in. The company have recently issued $750,000 of bonds for improvements.

The Electrical Accumulator Company has completed the plant in the commercial building, St. Louis. In this station they have 50 cells, connected with a 75 light dynamo, and by running the dynamo during the day they are enabled to store sufficient current to run 75 lights all night. They can thus run 150 lights if they desire to run the dynamo at night in connection with the storage cells. David J. Harris is the general manager of the St Louis company.

The Portland, Oregon, Real Estate Company and thirty-three others owning property fronting on Hawthorne avenue, a country road leading from its intersection with Fifth street, East Portland, two and one-half miles, filed a petition in the county court yesterday, asking that George W. Brown be granted a franchise to construct a motor line along that road. Mr. Brown, in his petition, asks a fifty-years' franchise to build and maintain a single or double track street railroad, to be propelled by animal, steam, electricity or cable power.

The enterprise of Messrs. J. M. Bartholomew, Hon. J. G. Slonenecker and others, forming the Rapid Transit Company of Topeka, in adopting electricity as the motive power for the entire 15 miles of the road, is attracting much attention in the West, as indicating the progressiveness of Topeka's citizens. It is expected that the road will be operated by the electrical system early in January, and the Thomson-Houston people are making a special effort to have it ready the earliest moment possible. Nearly 200 men are at work wiring, planting poles, and putting up the station.

The Electric Light Popular in the Government Buildings.

In the report of the Secretary of the Interior, just published, Mr. Vilas says:

"I have already sufficiently called attention to the necessity for the removal of the General Land Office from the Patent Office building. Otherwise the Patent Office building is in excellent condition. Upon a careful inquiry, I ascertained that the appropriation made some time since for an electric apparatus would prove adequate to the needs of the Department if properly expended, and therefore withdrew the request for a larger appropriation. Arrangements were made, with the valuable and learned assistance of Lieutenant-Commander Bradford, of the U. S. Navy—among the most expert and practical of electricians—after inviting proposals by advertisements, with the Brush Electric Light Company, of Cleveland, Ohio, for the construction of the necessary machinery and the arrangement of wires, appliances and lamps, for the Patent Office building, in order to light it completely. New boilers and a new engine have also been provided, and the Department will be able to furnish its own light at so great a diminished cost, that it is believed the saving from the average outlay heretofore sustained will, in three years, re-imburse the expenditure for the plant. Especial advantage is secured in safety. There are such vast piles of public papers, records and documents, in the various rooms, halls and cellars, of the Department, many of these so dark as to require light throughout the day, that a mode of illumination which is consistent with their safety becomes of prime importance. It is believed that this object has been most satisfactorily secured by the arrangements made under the direction of Lieutenant-Commander Bradford. I avail myself of this opportunity to express my sense of obligation, official and personal, for the great advantage enjoyed in the generous contribution of his expert and valuable knowledge, from which I have reason to believe the electrical equipment of the Department will hardly be equalled in the country for safety and efficiency, procured upon the most economical terms."

The Citizens' Association presented a long communication to the Board of Aldermen, on last Monday night, relative to the price paid by the city for its electric lights, and after making numerous comparisons with other cities, asking that action may be speedily taken to remedy the evil, if Boston is paying too high. Testimony was introduced from the superintendent of lamps, who would not admit an excessive rate was paid, and shifted the responsibility from his department in any event.

Electric Power in the West.

It is astonishing how the motor field is opening up in the West. I have before spoken of motors in Chicago. Up at Molene, Ill., there is a water-power company, and there is some sort of a tangle in the way of proprietary rights, so that power has to be sold and bought back in some way before it can be utilized. That is, A sells power to B, who changes the power into something else, and A re-purchases it, and sells to C. They do that sort of trading to comply with some legal requirement or other. Well, in addition to other motors being run in that way, a saddlery hardware concern has recently started up with a 10 horse-power Baxter motor, the People's Light and Fuel Company, as well as the water-power company, is quite likely to go into the motor business in real earnest.

A recent article from Virginia, Nevada, gives an advanced idea of the value of motors in mining. The heavy cost of fuel, and the high prices of labor made it impossible to work that class of mines to which the Big Bonanza belongs. The depth of these mines had become so profound, that to clear them of water was impracticable, and only one of the Comstock mines was paying dividends when the Sutro tunnel was commenced. This tunnel, running into the mountain's base, meets the shaft of the Cholar mine, 1,700 feet below the surface, draining it perfectly. The water is conducted in pipes, and falls on six large water-wheels with a pressure of 680 pounds to the square inch. These wheels transmit power to six dynamos in the tunnel; the current so generated is carried to the surface where it operates a gang of brush motors revolving at the rate of 850 revolutions per minute. The loss due to conversion is about 40 per cent., so that three-fifths of the power is utilized.

In a country where every pound of coal has to be carried up the mountain on the back of a burro, a ton costs anywhere from $12 to $25, and this must be paid, or the other horn of the dilemma must be seized, and all the ore transported to lower levels. In either event, a low grade ore "eats its life out" in the expense attending its reduction.

But with a never-failing supply of water-power, that runs day and night with no cost to its owner, even with 40 per cent. total loss in conversion, there can be no choice as to the course for the owner of a low grade mine to pursue, no doubt as to the result.

It is claimed by the Nevada miners that this application of electricity, which is one of the largest in the world, opens up the utilization of the great water-power of the Truckee River, 16 miles from the Comstock mines, and that at least 1,000 stamp mills could be run on low grade ores at a fair profit.

C. C. H.

The first of a fleet of electrical power boats destined for use on the River Thames, was recently launched from a yard at Chiswick. The boat is intended to carry 80 passengers; her length is 65½ feet, beam 10 feet, displacement 12½ tons, and speed according to the regulation of the traffic on the Thames by the Conservancy Board, six miles an hour. The machinery and storage cells are placed below deck. The boat carries 200 E. P. S. accumulators, and two 7½ horse-power motors drive twin three-bladed propellers made by Thorneycroft & Company. The center of the boat carries a cabin with lavatories, dining-tables, etc. Imisch & Company, Kentish Town, were builders.

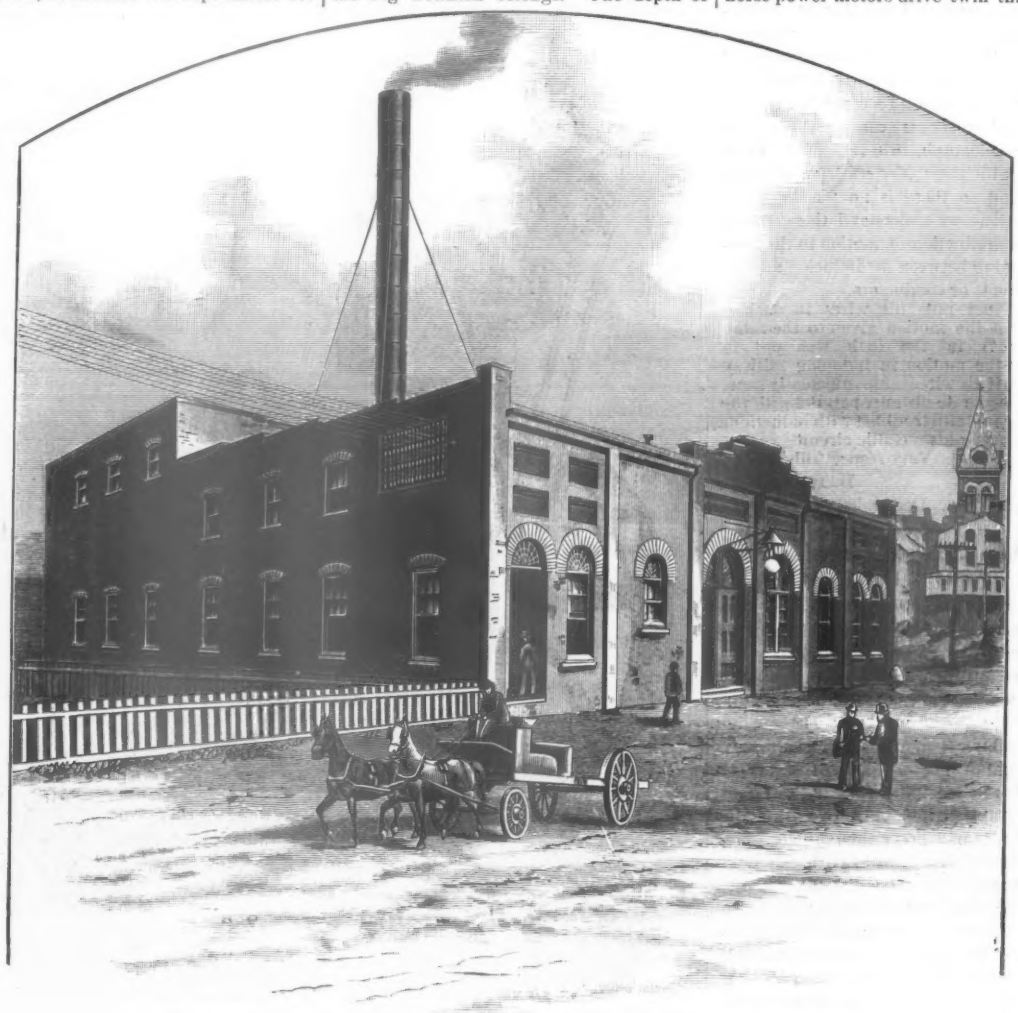


FIG. 1.—EXTERIOR VIEW OF THE MALDEN, MASS., ELECTRIC LIGHT STATION.

The Merrimac, Mass., *Budget* says: With the electric railway should come the electric light, and we have no doubt it can be introduced here as low as anywhere. Amesbury will only be too anxious to sell us light at a low rate. The matter of introducing the electric light in Merrimac is being talked up, and we trust that within a few months something definite may be done in this most important municipal improvement. This town should not be behind the times.

The work of setting poles has been commenced on the electric railway between Merrimac, Amesbury and Newburyport, Mass. The system is the Thomson-Houston. It consists of overhead and ground circuits, each being of compound character.

Mr. W. N. Bingay, engineer and electrician of Yarmouth Electric Light Company, Nova Scotia, is visiting New York.

Central Electric Light Station at Malden, Mass.

The rapid growth and development of electric lighting business is not better illustrated than by the central stations which are constantly being built for lighting and power purposes. Each year sees stations built of a better quality than the previous year, and equipped with every facility for successfully handling a large and increasing business. The central station at Malden, Mass., is an example of the wonderful growth of a local plant. The station used by the company previous to the occupancy of the one illustrated, was a small wooden building, the equipment of which was entirely inadequate to the demands made upon it. The present station is fully equipped with arc and incandescent apparatus made by the Thomson-Houston Electric Company.

The electrical plant consists of one 400-light direct current incandescent dynamo, four 500-light alternating current incandescent machines, four 50, and one 35-light arc dynamo. The power plant consists of five 80 h. p. A. & S. engines, three 150 h. p. boilers, and a Worthington condenser of a capacity of 500 h. p. The lighting from this station comprises commercial and street lighting in Malden, Medford, Everett and Melrose, and covers an area of 25 square miles, in which 120 miles of wire has been used. The street lighting comprises arc lamps of 1,200 c. p., and 25 c. p. incandescent lamps, operated by the Thomson-Houston system. There are 19 circuits of these lamps of 40 each, and they form a valuable addition to the arc lamps for street lighting purposes. They are placed on lamp posts, an extension being used which brings them about three feet over the street. In addition to their commercial and street lighting business the company have begun to install lamps in private residences. They are meeting with much favor, and the orders for them are rapidly increasing. The new Thomson-Houston electric metor is used in all these installations. It certainly is proof of the excellence of the management of the company to see the rapidly increasing business, and the increase in the plant certainly is most flattering to the company which has furnished the entire apparatus.

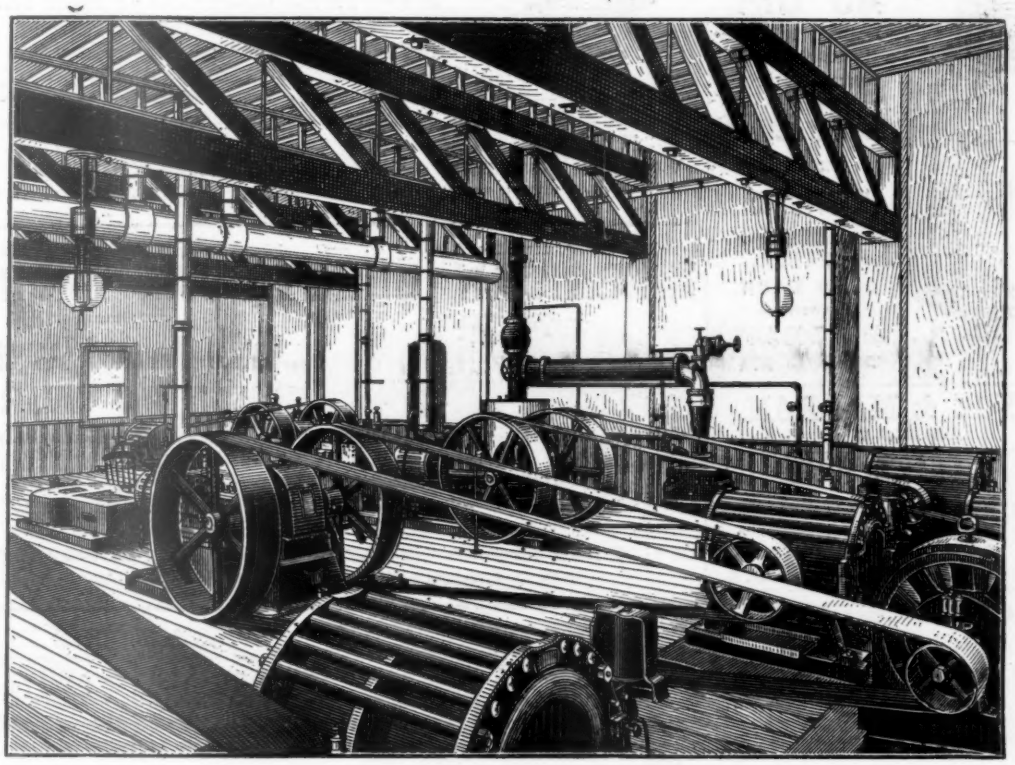


FIG. 2.—DYNAMO ROOM, MALDEN ELECTRIC LIGHT STATION.

—— The town of Whitman, Mass., has appropriated $3,000 for electric lights.

—— Braddock, Pa., is contemplating an increase of their electric light station. It was started April 3d, 1888, with 200 lights wired, and a station capacity of 650, 16 c. p. It is a complete Westinghouse plant from the engine out, and was the first Westinghouse plant contracted for by Frank S. Marr. There is at present about 700 16 c. p. lights wired and they average six hours per lamp per day.

NEW ENGLAND NOTES.

A good story is told of one of the men who has charge of the electric car that has recently been introduced in Lynn. The car was coming down a steep grade the other afternoon when a young lady signalled it. The car was stopped, but before the conductor had given the signal to go ahead it commenced to move, and the man at the crank vigorously plied the brakes and cried "whoa" at the same time. The incident was much enjoyed by the few passengers who "caught on," and a broad grin was on their faces for some time.

The matter of electric lighting in Merrimac looks very favorable and it is thought that a small plant will be put in, and if the people take hold of it liberally a boiler and engine can then be put in of capacity sufficient for all wants.

The electric road, Birmingham, Ct., is disabled by the bursting of the large driving pulley on the engine at the power plant in Derby. The accident occurred late Thursday night, and the damage done was heavy and will take some time to repair. The cars were of course stopped at different points on the line, and had to be drawn to the yard by horse power. The pulley was a large one, 15 feet in diameter, and with a face measurement of 33 inches. A portion of the pulley flew through the roof and knocked out some of the bricks of the side wall of the building. One entire half of the pulley cannot be found, and it is thought went into the river. It will be several weeks perhaps, before the road can be in working order again. The company are trying to lease some of the horses and the cars of the horse railroad company until they can run their cars.

The Citizens' Electric Company, of Worcester, has been organized. Capital stock, $10,000. John W. Dobbie, president, and John A. Gould, treasurer. For supplying electric light and power.

Richmond, Me., wants the electric light.

The electric light company at Burlington, Vt., is overwhelmed with orders for lights.

The contract for lighting the streets of Hallowell, Me., by electricity has been closed with the Hallowell Light and Power Company, who are to erect poles not less than 40 feet high, and furnish 12 arc and 16 incandescent lights, or 13 each on or before January 20, 1889.

The business of the Standard Light and Power Company, the electric light organization at Montpelier, has grown so that the appointment of a superintendent has become necessary, and C. A. Bailey has been chosen to fill the position.

The committee on ordinances and legislation at Lowell, has voted to report inexpedient on Warren Aldrich's petition to be allowed to erect poles and string wires to be used in furnishing electric power in Lowell.

A petition to the Maine Legislature asking a charter for an electric railway between Augusta and Gardiner, was put in circulation at the former city on Monday.

The Citizens' Electric Company, of Dudley and Oxford, Mass , has been incorporated, with a capital of $10,000. The plant is located in town.

The Woonsocket Electric Light Company has contracted with the Thomson-Houston Electric Company, of Boston, for a complete long distance or alternating system of incandescent electric lighting. This additional plant will entirely cover the field not now reached by the incandescent wires, and enable the company to supply the numerous demands for these lights from the Social and other outlying districts.

The recent severe storm did much damage to wires and poles throughout New England. Boston suffered quite severely, and the Salem electric lines were also much damaged. The great telephone frame on the Asiatic Building became loosened, and workmen were obliged to go aloft and secure it.

The electric system on the Wethersfield line has not yet been officially accepted by the horse railroad company of Hartford. The system has so far given good satisfaction, and undoubtedly will replace the use of horses on this line.

Lynn, Mass., is considering the advisability of municipal electric lighting, and a committee has been appointed by the city government to look into the matter.

Mr. Frank W. Sherman, of Ludlow, Vt., has been elected secretary and treasurer of a Denver electric company, who will introduce the Thomson-Houston systems into that progressive Colorado metropolis.

T. W. S.

—— The Gas Commissioners have granted permission to the Newton and Watertown, Mass., Gas Light Company to engage in electric lighting, prescribing a minimum capacity of 90 arc lights of 12,000-candle power and 1,500 incandescent lights of 16 candle-power.

—— The incandescent electric lights being put in by the Water Power Company, of Holyoke, Mass., for the use of manufacturers, business men and others, will be those of the Edison system, and the wiring will conform to the rules and requirements of the New England Insurance Exchange.

ELECTRIC LIGHT NEWS

—— M. D. Herring with others are erecting a plant in Waco, Tex. The Westinghouse system will be used.

—— The Council of Richmond, Va., have decided to purchase a machine for testing the power of electric lights.

—— Mr. W. C. Clarke is the agent of the Westinghouse System on the Pacific Coast, with headquarters in San Francisco.

—— The incandescent plant lately erected in Duluth is giving such satisfaction that the company is to furnish light to applicants.

—— The capital stock of the San Antonio (Texas) Electric Light Company has been increased from $50,000 to $100,000, and additional machinery purchased.

—— The Paris, Ky., Electric Lighting Company has recently been organized to light the public streets and for private use. Mr. G. S. Varden has charge of the company's interests.

—— The number of electric light lamps in use by the city of Brooklyn is to be increased. The city is now well lighted in certain portions, and the gas sections are clamoring for the electric light.

—— A part of the machinery for the electric light plant for South Omaha, Neb., has arrived. Work on putting up the poles is progressing rapidly, and the light will be in operation in about three weeks.

—— Bids for lighting Galveston and the public buildings for a term of five years, and bids for furnishing a complete electric light plant, will be received until January 5, by J. Reymershoffer, at City Hall.

—— John A. Lidback, of Portland, is constructing two engines to run the dynamo for generating electricity to light the new Pullman Oriental train from New York to San Francisco. The engines are of Mr. Lidback's invention and are something new.

—— The Edison electric light company has now over 1,600 lights in its system in Pittsfield, and more are to be added soon, the number to be 1,800 by January 1. Meters are being attached to all the places where the lights are being used.

—— The Dexter (Me.) Electric Lighting Company has purchased 100 cells of batteries of the Electrical Accumulator Company at Bar Harbor, and means in the future to store up electricity by day for use in the night. The Ellsworth Company has purchased 100 cells of batteries from the same company.

—— Electric work is increasing in the South. Dorsey, Paine & Company, of Chattanooga, Tenn., state that they are negotiating with parties in Texas for an electric street railroad, and think it possible they may close up a contract with them in the next 30 days. They have several electric light plants to place, two of which they expect to have in working order in about 60 days.

—— The Milford, Mass., *News* pays the following tribute to two electric light men at present in that town:

"The resignation of Supt. E. B. Swadkins, of the Electric Light and Power Company, will take effect February 1st, 1889. W. A. Edgecomb, his efficient assistant, will also resign, to take effect at the same time. Mr. Swadkins and Mr. Edgecomb expect, soon after they close their labors here, to make a pleasure trip throughout England, and inspect the various electric lighting systems and stations in that country. When Mr. Swadkins came to Milford about a year ago, it cannot be denied that the plant here was in a rather unhealthy condition, and gave anything but satisfaction to its patrons; but to-day, by his skill as an electrician, has put the plant here in a first-class condition, and we were informed the other day by an agent of the Thomson-Houston Company, that there is no plant in New England to-day running in better shape or giving more universal satisfaction than the Milford Electric Light and Power Station."

ELECTRICAL PATENTS

INDEX OF INVENTIONS FOR WHICH LETTERS PATENT OF THE UNITED STATES WERE GRANTED IN THE WEEK ENDING DECEMBER 4, 1888.

393,742 Dynamo electric machinery; W. Forman Collins, New York, N. Y.

393,744 Indicator for secondary batteries; C. C. Currie, Philadelphia, Pa., assignor to the United Electric Improvement Company, Gloucester, N. J.

393,745 Armature for dynamo electric machines; Leo Daft, Plainfield, N. J.

393,752 Apparatus for the manufacture of celluloid and similar compounds; Joseph R. France, New York, N. Y.

393,755 Mode of making secondary battery plates; William W. Griscom, Haverford College, Pa., assignor to the Electrical Accumulator Company of New York.

393,756 System of electric lighting; William W. Griscom, Haverford College, assignor to the Electro Dynamic Company of Philadelphia, Philadelphia, Pa.

393,757 Train lighting by secondary batteries; William W. Griscom, Haverford College, Pa.

393,824 Telephone exchange switch fastener; William M. Goodridge, Chicago, Ill., assignor to the Western Electric Company, same place.

393,823 Submarine and subterranean electric cable; Elias Flotron and Francois B. A. Royer de la Bastie, Paris, France.

393,828 Electrical water elevator for buildings; Albert E. Hall, Plainfield, N. J., assignor to the Hall Electric Pump Company, same place.

393,832 Process of manufacturing zinc; Henry A. Hunicke, St. Louis, Mo.

393,849 Dynamo electric machinery; Samuel E. Nutting, Chicago, Ill.

393,865 Semaphore signal; Frederick Stetzel and Charles Weinedel, Louisville, Ky., assignors to the American Semaphore Company, same place.

393,954 Method of producing electrodes for secondary batteries. 393,955 Electrode for secondary batteries; Henry Woodward, Shepherd's Bush, County of Middlesex, England, assignor to the Woodward Electrical Company, Detroit, Mich.

393,998 Electric bell; James F. McLaughlin, Philadelphia, Pa.

394,015 Motor for street cars; Wilber S. Salisbury, Chicago, Ill.

394,035 Electric motor. 394,036 Duplex electromotor. 394,037 Constant upward pressure contact for overhead conductors. 394,038 Duplex upward pressure contact. 394,039 System of suspending electric conductors; Charles J. Van De Poele, Lynn, Mass.

394,049 Workman's electric time recorder; William K. Bassford and Edwin B. Maynard, New York, N. Y., assignors to Wm. K. Bassford, Jr. & Co., same place.

394,062 Apparatus for removing scale from electric conductors; Leo Daft, Plainfield, N. J.

394,075 Electric motor and dynamo electric machine; Orazio Lugo, New York, N. Y.

394,081 Electric annunciator target; Francis J. Patten and Theodore A. Buegham, U. S. Army.

394,090 Thermopile; Henry Woodward, Detroit, Mich., assignor, by mesne assignments, to the Woodward Electrical Company, same place.

394,095 Commutator; Charles L. Buckingham, New York, N. Y.

394,100 Indicator for secondary batteries; Stanley C. C. Currie, Philadelphia, Pa., assignor to the United Electric Improvement Company, Gloucester, N. J.

394,139 Sectional double line electric railway; Sidney H. Short, Columbus, Ohio, assignor of one-half to Nathan B. Abbott, same place.

When Writing for Catalogues & ordering Articles advertised in our columns please mention that you saw the advertisement in the Electrical Review.

ALFRED F. MOORE,
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Magnetic Wire, and Flexible Cordage,
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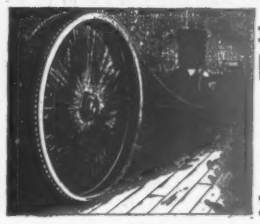

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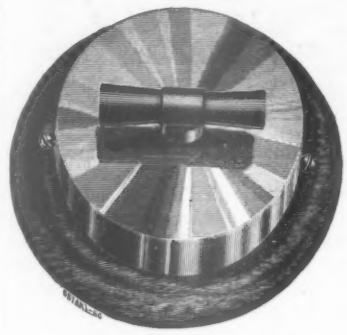

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